The

Electrical Review

VOL. CI. DECEMBER 16, 1927. No. 2,612.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

Chairman: H. ALABASTER

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Telegraphic Address: "AGEKAY, CENT., LONDON," Code, A B C. Telephone No.: Central 7072 (Three Lines).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d.; Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, LIMITED, and crossed "Midland Bank, Newgate Street Branch."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

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Instalment Buying.

THE practice of instalment-buying or hire-purchase, and its effect—beneficial or otherwise—upon the course of trade and industry is being more widely discussed than hitherto both here and in America. Of course, easy-purchase methods have been in vogue in many classes of shop and store trading in this country as long as we can remember; the system has been successfully employed in extending the use of gas stoves on a large scale, and it is recognised as a most useful practice. Some attention has been devoted to it as a factor for promoting increased electrical trade especially in domestic lines, but in our opinion it deserves more exhaustive consideration from commercial and financial electrical men as well as those directly engaged in electricity supply.

Nobody will wish to deny that there are certain lines of electrical products which will not reach what seems to be a popular turnover of reasonable proportions until the public is given plainly to understand that comparatively costly articles can be secured or purchased by fairly easy means. We need not recapitulate all the efforts that have so far been made by electric supply authorities, contractors, factors and manufacturers, but we are not overlooking them when we say that operations have been on a very limited scale, have been isolated, or widely scattered, and have lacked the measure of uniformity and consistency with which large-scale management and finance might have invested them. What electrical undertakers, manufacturers and contractors have to recognise is that they cannot expect to be so successful in their isolated acts as a great gas company with a capital of 28 millions sterling and all that that means by way of financial elasticity for business-getting purposes. Which of our large metropolitan electricity undertakers—and some of them count their capital by many millions—has ever faced this instalment-buying proposition on anything approaching a scale proportionate to its financial stand-

ing or the prospects of its area? And if several or all of them in a district were to band themselves together in a large-scale scheme which could impress the public as the operations of the Gas Light and Coke Company do, would it be a movement greater than the electrical industry could be reasonably expected to put forth? In a recent address at Chicago Mr. Samuel Insull dwelt upon the vast benefits that have been brought to the consumer as the outcome of interconnection and consolidation. He is particularly interested in the financial aspects, allows no trace of nervousness to mar his policy of financial consolidation and interconnection, and anticipates ever-growing calls for capital for electrical expansion. A perusal of his views and a consideration of much else that is appearing in our own and in the American Press just now leads one to wonder whether, with the British electrical industry committed to a big distribution movement during the next few years, the time has not arrived for some big financial move to be made here with the object of accelerating the adoption of electrical appliances by hundreds of thousands more householders. Imagine an electricity supply group controlling 28 millions of capital as the Gas Light and Coke Company does in its own field—is it conceivable that that group would make no greater headway than all the separate units in the area are doing in the aggregate to-day? We might well be preparing our minds, even our actual plans, for some big move to follow upon the propaganda and other activities of the Electrical Development Association. It was reported in our last issue that the Electrical Contractors' Trading Committee had recently been making progress with the proposed formation of a new company to finance hire-purchase business. It is expected shortly to be inaugurated and we shall probably have the details vouchsafed before long. We hope that those who are directly interested in this particular company project, and many other leaders in the industry, will consider whether the time is not suitable to start out upon a really big scheme for making up the trading deficiencies that exist, remembering that recent authoritative speeches have stressed the enormous importance of distributing electricity to everybody and therefore securing that everybody shall be provided with the appliances for its utilisation.

If we turn from the purely electrical aspect of the subject to the general policy of instalment buying as it is being discussed by financial and economic authorities here and in America, we find it full of interest. Business people in the States speak highly of such trade, for where there is unlimited money in the banks, the public runs little risk in embarking upon its hire-purchase transactions, and manufacturers and factors have little occasion to fear. If there is slackening of trade, employment becomes less brisk, bank deposits are drawn upon, and the risks naturally become larger. It has been rightly pointed out that American experience alone is no safe guide for us, because it is in times of general trade depression that the real test of the system comes, and present-day America knows little about depression. Even the period of depression which seemed to be approaching has, according to reports, passed by on the other side—a little languishing was felt, but gradual improvement has already appeared, and there are those who even assert that 1928 will witness the greatest prosperity that the U.S.A. has ever known.

The motor-car interests of America declare that their business has been built up as to 60 per cent. of it on the instalment-buying system.

Hire-purchase dealings in the American electrical world are more advanced than they are here, because in many districts they have reached saturation point in electrical installations while we are trying to make headway with assisted wiring. In their saturated areas, the main wiring being already done, each addition in a household represents some new appliance, a trade transaction, very frequently on the easy-payments system. If the business is sound, the public is pleased, and trade becomes increasingly active and factories are kept busy. While there is plenty of money at the bank the loosening of the purse strings creates new trade.

We may direct the attention of those who are interested in the subject to an article appearing in the current issue of the *Monthly Review* of the Midland Bank. It may seem surprising to learn that the aggregate cash value of sales on the instalment plan in the United States in 1925 was between 900 and 1,200 million pounds sterling, but this is out of the colossal retail trade of between 7,000 and 8,000 million pounds sterling, so that the total retail sales conducted on the instalment plan in the United States is somewhere between 11 and 16 per cent. The *Review* therefore points out that, notwithstanding its rapid growth, the instalment plan remains a minor method of financing retail trade. It is calculated that the average debt outstanding amounts to about 42½ per cent. of the total instalment sales, and the average instalment debt is worked out at nearly twenty dollars per head of the population. There are over 1,000 finance companies now operating in connection with the system, and these carry about two-fifths of the total debts involved, the remainder being borne partly by retailers and manufacturers out of their own resources and partly by banks through direct loans to their trading and manufacturing customers. Large accommodation is granted to wholesale dealers. The *Monthly Review* enters into the subject of estimated losses which are found to be very low, smaller than might be expected under ordinary conditions of trade—neither boom nor slump periods—and the conclusion is reached that in the main instalment-buying has become firmly grounded on a sound basis and subjected to well-regulated scientific rules.

We have made this review of the situation thinking that it might be of some assistance to the many electrical minds that are interested in the subject and have to decide whether the electrical trade of the United Kingdom may not be materially assisted in the important period that is approaching by a much wider application of the system on sound lines. Of course we shall remember that America is not Britain, but the close attention that is being given to the subject by our financiers and by bankers, as evidenced by our quotations from the Midland Bank *Review*, may be regarded as a sign that the co-operation of some of our leading banks will be available if it is sought by electrical interests.

The Central Scottish Contract.

Some weeks ago statements appeared in a number of newspapers expressing apprehension lest important contracts for the Central Scotland electricity scheme should be placed abroad. We did not allude to the reports at the time, for we were unaware of any real grounds for such apprehensions. In any case it seemed almost too absurd for thought, after all that had been said in Parliament and out of it about the new electricity supply developments bringing contracts to British electrical manufacturers and giving employment to British workpeople, that our orders should go to foreign works for products in which we were able to excel. Whatever basis, if any, there may have been for fear, cannot be thought to exist now in presence of the announcement that has been made during the past week respecting the substantial contract (£400,000) that has been placed with the British Insulated Cables, Ltd., for the Central Scottish Electricity Scheme—228 route miles of overhead 132,000-volt transmission lines. Everything used will be British—the steel towers, insulators, conductors—works in various parts of the country feeling the benefit, as is indicated by the particulars published in our "Contracts Closed." We congratulate the British Insulated Company upon its success, and look to the Central Board with gratitude, yet asking for more and more orders of the kind as speedily as circumstances can be made to permit of their being placed.

The High-Frequency Steel Furnace.

IT is perhaps not generally realised that while in the manufacture of ordinary steels the various types of furnace employed, from the old coke fire to the modern electrode furnace, have marked successive stages of evolutionary advance, the practice followed in the manufacture of the highest grade of tool-steel has remained almost stationary. It seems that for the production of steel of suitable quality for making special tools, watch springs, and so on, the crucible-heating principle is essential, and in any of the developments prior to the advent of the induction furnace it has not been possible to retain or capture this principle.

The recent introduction, therefore, of the high-frequency furnace at the Imperial Works of Messrs. Edgar Allen & Co., Ltd., Sheffield, which is described elsewhere in this issue, for the commercial production of the highest quality of steel, representing a radical departure from the primitive coke furnace after a period of nearly 200 years, is an event of great importance to the steel and electrical industries, and will probably have far-reaching effects.

The significance of this development may possibly be hidden under the fact that crucible steel is not required in large quantities, but it should be remembered that on the production of high-grade steel many industries all over the world depend, and the progress of the steel industry is of vital importance to this country. To retain the principle of crucible production and at the same time introduce considerable economy in the process, is an achievement of which all concerned have reason to be proud, and we congratulate those who have steered the apparatus through the experimental stages, the designers and manufacturers of the commercial equipment, and the users, on their enterprise.

Further, the fact that at this stage of development the cost of high-frequency heating appears to approach that of other electrical methods augurs well for the future, and it is reasonable to believe that with the advance in the construction of high-frequency generators, which governs the commercial application of high-frequency heating, the new method will be used for the production of steel in larger quantities.

It is particularly pleasing to note that the furnace, which is believed to be the first of its kind to be installed in the world for the commercial production of steel, is an English development, and also that a British firm supplied the generating equipment.

Finally, the new apparatus is another example of the relief which is brought to the operatives by means of electricity; the working conditions inseparable from the old method of crucible heating are particularly severe.

Charges for Electricity.

"THERE'S a cry and a shout, and *no end* of a rout"—someone has discovered that the price of electricity, after all, is not to come down with a run to "1d. a unit, or less," and has revealed the deadly secret to the *Evening Standard*! The same enterprising paper has repeatedly drawn attention to the wide disparities between the prices charged in different London boroughs, and last week it gave great prominence to the comments of the London and Home Counties Joint Electricity Authority on that subject—which were also reproduced, but with less emphasis, by other journals. In course of time the public will doubtless find out where it stands. Whilst the Electricity (Supply) Bill was passing through Parliament last year, the lay Press, with few exceptions, would tolerate no criticisms of the measure—political exigencies required that it should be passed, and passed it was—but the truth, which was constantly expounded in our pages, cannot be suppressed for ever.

In this instance the mine was sprung by Mr. R. Moritz, K.C., who roundly declared that the householder was likely to gain "precisely nothing" from the working of the Act, and gave chapter and verse for his contentions. In some respects we cannot go with him all the way, but in the main his views are sound, and "one of the greatest authorities on electricity in this country," who undertook to explain to the readers of the *Standard* how grievously Mr. Moritz's "ebullitions" were in error, himself boiled over in the effort to refute the allegations. The sincerity of that effort may be judged from the fact that this authority sets up the *average revenue* of electricity supply undertakings, which he put at 2¼d. a unit, in contradiction to Mr. Moritz's statement that distribution accounted for five-sixths of the price *for lighting*, 4d. or 5d. per unit. Recent reductions in price in the West End are cited as the result of interconnection and the use of the most economic stations—but the "authority" omits to state that the Act of 1926 was not in any way responsible for those reductions. It has not benefited anyone yet except the new bureaucracy that it has brought into existence. The same authority repeats the statement that the Act is "but a repetition" of what has "proved the solution of cheap electricity" elsewhere; in fact, it sets up a system for which there is no parallel and no precedent anywhere in the world.

In one point the "authority" accidentally nearly hits the mark. He states that "the capital charges represent 50 per cent. of the basic cost of the unit"; this is actually the case in the County of London Company's area, where the capital charges amount to 2·47d. per kWh, which is no less than 74 per cent. of the average price received, 3.33d. per unit (1925 data). This Company charges the private householder 7.15d. per unit for lighting and 2.1d. per unit for heating. As the "authority" points out, some public companies in the West End and City charge ½d. per unit for heating.

Unauthorised Electricity Supply.

A CASE which was recently heard by Mr. Justice Russell in the Chancery Divisional Court has attracted some attention, as being the first of its kind: the Caerphilly Urban District Council sought to restrain a local draper and property owner from supplying electricity from his private generating plant to his tenants, on premises situated within the Council's area.

Prior to 1909 it was lawful for anyone to supply electricity to any consumer, without statutory powers, whether the premises concerned were within the area of a duly authorised undertaker or not; Section 23 of the Electric Lighting Act passed in that year, whilst not interfering with such supplies which were already in operation, forbade the commencement of similar supplies within the area of a statutory undertaker, unless they were subsidiary to the business in which the supplier was primarily engaged. In the case under consideration, in view of the plain wording of the proviso, the only question for the Court to decide was whether the landlord's business was primarily that of supplying electricity, and the decision was in the negative. The reason why the subject has not previously arisen in the Courts is presumably that in such cases the subsidiary character of the electrical business has been obvious and the verdict a foregone conclusion; but those who embark on such enterprises must "watch their step," and take care to keep their private undertakings within reasonable bounds, lest the business grow to such dimensions that it can be shown to be of "primary" importance as compared with their other interests, thus bringing them within the scope of the Section.

The existence of businesses of this kind within their areas must be somewhat irksome to the managers of authorised undertakings. Their only remedy would appear to be the supply of electricity at rates below those of the privateer— no easy matter in these days of cheap and economical oil-engines, or in the neighbourhood of small water-powers whose capital cost has long been written off. Having no statutory obligations, and a minimum capital outlay on plant and mains, the private supplier can offer his clients very low rates.

A Large Electric Colliery Winder.

Descriptive details of the "Metrovick" 3,000/7,500-h.p. double-motor, direct-current winding plant, controlled on the Ward-Leonard principle, which has been installed by the Carlton Main Colliery Co., Ltd., near Doncaster.

THE largest electric winder installed in this country is an equipment of 3,000/7,500-h.p. at the Parkgate No. 3 Pit of Grimethorpe Colliery, near Doncaster, which is owned by the Carlton Main Colliery Co., Ltd., of Barnsley.

The plant was supplied by the Metropolitan-Vickers Electrical Co., Ltd., and consists essentially of a double d.c. motor directly coupled to the winding drum and controlled on the Ward-Leonard principle, with the aid of a flywheel motor-generator set, by means of which a.c. power is taken at 3,000 volts, 50 cycles, from the Colliery Company's power station and supplied as direct current at 1,000 volts to the winding motors.

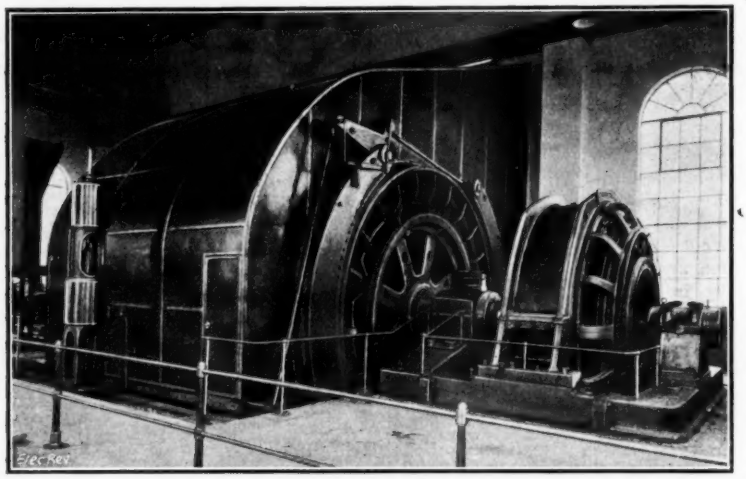


Fig. 1.—3,000/7,500-H.P. Winder at the Parkgate No. 3 Pit of the Carlton Main Colliery Co., Ltd., showing one Motor.

The shaft at which the equipment is installed is a new one, and the winder was first used for sinking operations. The main working conditions are as follows:—

Depth of shaft	2,610 ft.
Weight of cage and chains...	17,196 lb.
Weight of one tub	7.8 lb.
Net load of coal per cage ...	14,780 lb.
Output per hour	300 tons
Type of rope	Locked-coil
Diameter of rope	2 inches
Type of drum	Bi-cylindro-conical
Small diameter of drum ...	16 ft.
Large diameter of drum ...	26 ft.

The two winding motors are disposed one on either side of the drum, as shown in figs. 1 and 2; they are open machines with commutating poles and separately-excited shunt fields, each being 13 ft. 4 in. in diameter and weighing 67 tons. They operate at 49.6 r.p.m. in series connection at 1,000 volts, and the normal h.p.-time diagram (fig. 3) strikingly indicates the effect of the flywheel in eliminating the peaks, so as to obtain an approximately constant load demand throughout the wind; the set is capable of dealing with a maximum peak of 7,500 h.p., and of sustaining an overload of 25 per cent. for two hours. The connections of the machines are so arranged that in case of emergency the winder can be driven by one motor and fed by one generator of the motor-generator set, which is shown in fig. 4 with its exciter set in the foreground. It consists of a slip-ring induction motor of 1,540 h.p. driving two 1,065-kW, 500-volt, direct-current generators connected in series and a solid-steel flywheel, of 23 tons weight and 12 ft. diameter, mounted between them. The induction motor is of the open protected type with inside slip-rings and brushgear suitable for continuous running; its synchronous speed is 750 r.p.m. The generators are of the open compensated type, their overload capacity after six hours' full-load run being 25 per cent. for two hours, or a momentary peak of 4,240 kW total for the two machines.

The flywheel is of the Metropolitan-Vickers special disk type; made of cast steel, it is unpierced at the centre, being carried on two jack shafts which are attached to the wheel by spigoted flanges, arranged so that the torque is transmitted through keys and not through the fixing studs. The wheel is provided with a planished-steel guard over its upper part, while the lower portion runs in a pit in the foundation. In this way air resistance is reduced to a minimum, the energy delivered by the wheel during a 15 per cent. drop in speed being 45,000 h.p.-seconds.

The set is mounted on a combination bedplate, and the shafts are joined by rigid couplings; of the five pedestal bearings, those for the flywheel are force lubricated, and the others ring lubricated. The centrifugal overspeed-prevention device consists of a plunger in a diametrical hole in the end of the shaft, governed by a spring, so that when the speed exceeds a predeter-

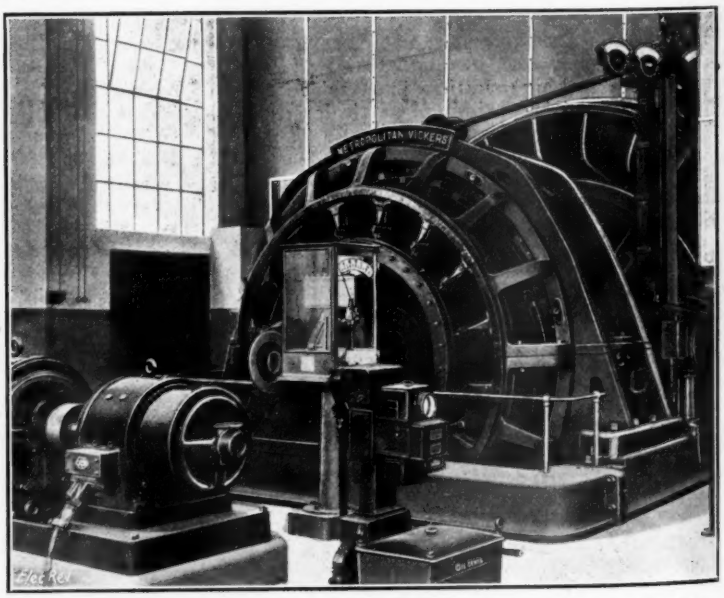


Fig. 2.—Winder Motor, Depth Indicator, and the Lilly Overwind and Overspeed Controller.

mined limit, the plunger flies out and operates a small auxiliary switch connected in the trip circuit of the equipment.

The exciter set consists of two 500-volt d.c. generators driven at 725 r.p.m. by a 3-phase squirrel-cage 440-volt 50-cycle motor. One generator is of 32 kW capacity, and provides the excitation current for the two winding motors; the other is of 13-kW capacity, and excitates the two d.c. generators, the three machines being mounted on a common bedplate and rigidly coupled.

For controlling the motor-generator set, a combined

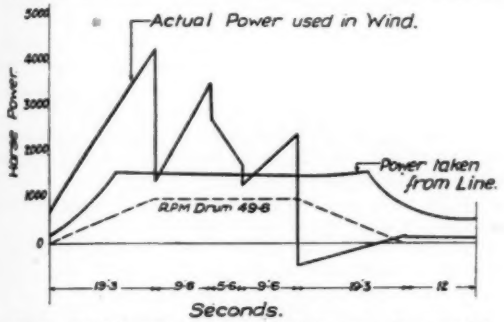


Fig. 3.—H.P.-Time Diagram for the Winder under Normal Load.

automatic slip regulator and starter is installed. The amount of resistance in the rotor circuit is automatically varied in proportion to the load on the induction motor, so that when a sudden overload of short duration is experienced, the motor is permitted to drop its speed and the flywheel to give up sufficient stored energy to deal with the peak. The induction motor is thus protected from violent momentary overloads, and the demand from the line is kept practically constant. The slip regulator is of the liquid type, the automatic movement of the electrodes being effected by the action of a torque motor mechanically coupled to the operating gear and supplied with current from the secondaries of series transformers connected in the three phases of the supply circuit to the induction motor; thus, any tendency towards an excessive current is communicated to the torque motor, and produces the necessary movement of the electrodes. When hand operation is required, for instance, when the regulator is being used to start the set, the automatic feature can be cut out by short-circuiting the series transformer secondaries with a switch provided for the purpose.

The control system for the winding motors is so arranged that regulation is carried out in the field of the generator exciter, thus obviating the necessity of handling a powerful field on the Ward-Leonard controller. The controller is of the "Metrovick" face-plate type, with resistances constructed on the unit principle; the spindle is mounted in ball bearings, and is operated by a lever system from the control cabin. Incorporated in the system are complete safety devices; for example, cam gear positively prevents the driver from accelerating too rapidly, while allowing him at will to reduce the rate of acceleration, or to maintain any speed within the safe limits for which the gear is set. Towards the end of the wind it returns the control lever at a predetermined rate towards the off position, so that it is impossible for the cage to reach the bank at more than creeping speed. In the event of the cage being allowed to pass the decking level, overwind trip gear incorporated in a Lilly controller will cut off the excitation and cause the brakes to be applied, a similar effect being produced if the driver attempts to start in the wrong direction. The Lilly controller, which can be seen on the right of the motor in fig. 2, also protects the winder against overspeed at any portion of the wind, and gives warning of the correct time at which retardation should commence. Overloading the winding motor, or failure of its field; overspeed of the motor-generator set; or failure of power supply, oil feed, or air supply, are also provided for by automatic tripping of either the winder safety circuit or the main oil switch; a hand-operated trip switch is also provided for the driver's use in case of emergency.

The incoming 3,000-volt supply is taken to a switchboard comprising two sheet-steel cubicles, one of which controls the supply to the induction motor of the main motor-generator set and the other that to a transformer which provides a low-voltage supply to such auxiliaries as the exciter motor and the motor driving the air compressor for the brakes. The d.c. and low-voltage a.c. switchgear is mounted upon a panel switchboard which also accommodates the relays and other details of the protective equipment.

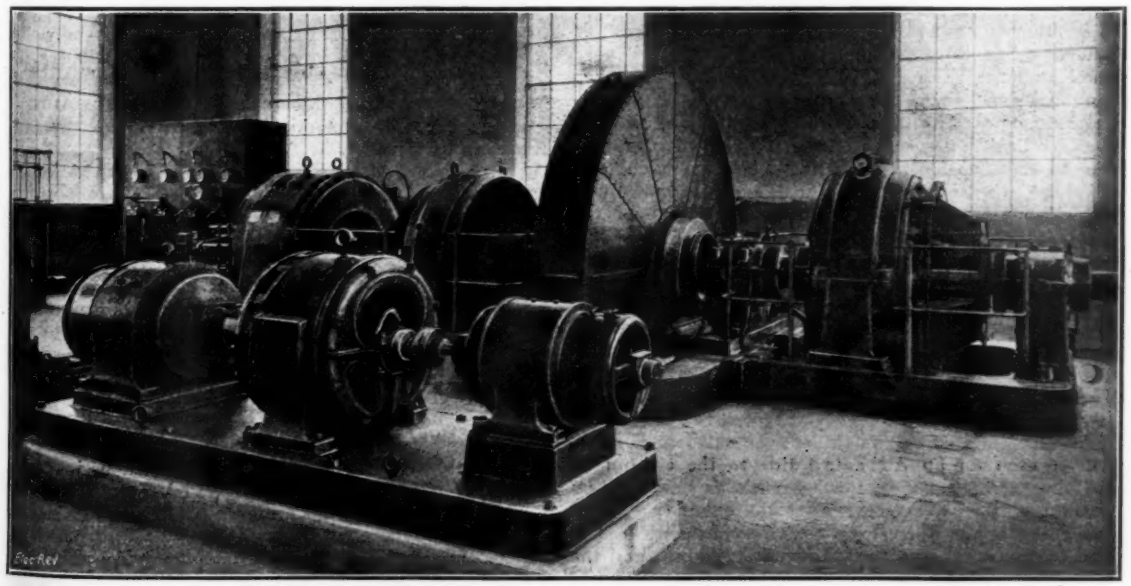


Fig. 4.—Motor-Generator Set with 23-ton Flywheel; Exciter Set in Foreground.

Finally, we must not omit to mention the fact that the mechanical portions of the winding equipment described above were made by Messrs. Markham & Co., of Chesterfield.

Pulverised Fuel on Board Ship.

The successful voyage of the U.S. Shipping Board's vessel *Mercer* across the Atlantic, burning only pulverised fuel, opens a prospect of increased consumption of coal, of the greatest importance to the British coal-mining industry.

Pulverisers or Stokers?

A comparison between the methods of firing furnaces for steam generation; criticisms of the claims put forward for pulverised-fuel equipment.

By E. B. PAUSEY, A.M.I.E.E.

(*Concluded from page* 985.)

IT is very doubtful whether the claim that the powdered-fuel furnace can make use of low-grade fuels, unsuitable for the mechanical stoker, can be fully substantiated. The normal chain-grate or underfeed stoker can, without alteration, other than the usual adjustments in operation, burn with complete success fuels varying in calorific value between 7,500 and 12,500 B.th.u. per lb., in ash content from 25 to 5 per cent., and in moisture content between similar limits. The most important factor governing the suitability of a fuel for use on a mechanical stoker is the amount and quality of the volatiles; if these are plentiful and of good calorific value the fuel will burn readily, even with higher ash and moisture contents than those mentioned above, and CO_2 percentages can be maintained at a very high value, even with the lowest grades of coal. Some modern mechanical stokers, such as the Erith-Roe and the Illinois balanced draught, claim, apparently with good reason, to be able to burn successfully coals with a volatile content as low, I believe, as 15 per cent., so that here, again, there does not seem to be much room for improvement in the pulverised-fuel furnace.

One more "con": If the superiority claimed for the pulverised-fuel boiler were comparable to that of the steam turbine this particular matter might not be worthy of much consideration, but, as we now begin to see that the margin is, to say the least, narrow, it behoves us to take note even of details of seemingly small account. The coal used on a mechanical stoker can easily be metered by the use of an automatic weigher, by which, in conjunction with other instruments, a day-by-day check on the efficiency of operation can be made as a matter of routine, and, when tests of short duration and particular accuracy are required, it is easy to obtain an exact estimate of the coal used by supplying it to the boiler in weighed bags, strickling the stoker hoppers at the start and finish of the test period, and making an allowance for the thickness and condition of the fires. But with pulverised fuel it does not seem possible to obtain any useful figures relating to the consumption of coal or efficiency excepting over comparatively long periods. The only possible location for automatic coal weighers seems to be between the coal bunker and the pulveriser, and the record of the weight of coal pulverised would not be even an approximate guide to the amount of coal burnt over a short period such as one day, on account of the uncertainty as to the quantity of dust coal lying in the pulveriser, the various ducts, feeders and conveyors, the pulverised-fuel storage bin, and the other etceteras of the system. On this account it would seem necessary that the official acceptance trials would have to run at least a week, and preferably a month, if accurate and reliable test results were required.

The preliminary drying necessitated by the pulverised-fuel system would appear to be a definite source of loss. Having regard to the difficulty of rapidly drying large quantities of wet coal, it seems unlikely that the efficiency of the drier can be as high as that of a moderately efficient boiler—indeed, I should not expect it to be more than 50 per cent. This is likely to be further reduced if the boiler is to compete with the chain-grate stoker in respect of its ability to make use of a wide range of fuels, for the stoker can deal quite easily with extremely low-grade coals containing largely quantities of clay-like refuse, a material very retentive of water, and having a moisture content of the order of 30 per cent., and if the pulverised-fuel plant is to be able to handle fuels like this it must be equipped with a dryer of sufficient capacity to bring it from the sloppy condition in which it arrives to a state suitable for pulverisation. But this implies that the drier will be of much too high a capacity for ordinary fuels containing only 8 to 12 per cent. of moisture, and when such fuels are in use there is every probability that excessive quantities of heat will be wasted through the over-drying of the coal. This objection is of the more importance in that the normal supplies of fuel are of the type containing 8 to 12 per cent. of moisture, and excessive moisture contents are abnormal. One may say that it is not economical to provide for such abnormal cases, but it is obvious that the range of fuels available for use is limited by the capacity of the drying apparatus for driving off the excessive moisture. The chain grate, on the other hand, suffers from no such disability; it is able effectively to deal with fuels containing large quantities of moisture, and it always dries at nearly the highest possible efficiency, for all the heat not used in drying off the moisture is available for use by the boiler. A further disability of preliminary drying is that coal, when heated, tends to lose some of its calorific value by some of the volatile matters distilling off, or, possibly, by oxidation. I have found experimentally that when coal is dried in a hot-air oven at 220 deg. F. for one hour (when determining the hygroscopic moisture content in the laboratory), this loss is as much as 3 per cent. Mechanical stokers are, of course, not subject to this loss.

That is the case—if not the whole of it, at least a very fair sample—against pulverised coal. Let us now see what there is to be said on the other side. It must be admitted that the system of burning coal, when suspended, in a state of very fine division, in an atmosphere heated to the temperature of combustion, appeals very strongly as an ideal way of burning coal. The fine division enables the oxygen of the air to gain the freest possible access to the fuel, and the suspension in a strongly heated atmosphere is more likely to give rapid and complete combustion than the widely varying temperatures to which the fuel is subjected in a stoker-fired furnace. It seems certain that such favourable conditions must enable combustion to be more efficient with pulverised fuel, even though the advantage be only moderate and much less than some enthusiasts claim.

I think that the strongest advantage the pulverised-fuel system has is its extreme flexibility. With a mechanical stoker any departure from good combustion conditions, which may be caused by a mistake on the part of an operator, an unexpected increase or decrease of load, or a change from one kind of coal to another, necessarily requires a considerable time to rectify, whereas with pulverised fuel any such departure from the maximum efficiency would at once be made evident by the CO_2 indicator, and the adjustment of one or two valves or dampers would forthwith put matters right. This is a very strong point indeed, and in my opinion it goes very far to weighing down the scales in favour of pulverised fuel with a bump. The ability to make rapid adjustments with certainty is of particular value in power-station work, where conditions may change rapidly and without warning.

The final summing up is not very difficult, but a

firm decision is hard to make. The great advantage of the pulverised-fuel boiler is its extreme flexibility in dealing with variations of fuel, conditions and load, together with its ready adaptability to scientific control. The opposing advantages of mechanical stoker firing are the absence of any necessity for preliminary drying of the fuel, lower capital outlay, and greater simplicity. On the whole, I think the verdict must be that, while the pulverised-coal system is probably slightly preferable to the mechanical stoker, it has nothing like the ascendancy that the steam turbine has over the reciprocating engine. Whichever system is favoured, the most important factor in obtaining the best possible results is the human element; enthusiastic keenness, close attention to details, and sound technical common sense are the prime essentials. A moderately well-equipped mechanical stoker plant operated by a staff so qualified will be markedly superior to the most modern pulverised-fuel plant operated under less favourable supervision, even though it may be the last word in ensemble and have a most imposing array of instruments. This human factor demands much more careful consideration than the comparatively unimportant question which forms the title of this article.

Our Foreign Electrical Trade.

Origin of imports and destinations of exports, with figures for 1926 and previous years compared.

WITH the issue of the several annual statements of the foreign trade of the United Kingdom in 1926 it is now possible to survey in detail the distribution and origin of our exports and imports of the principal groups of electrical material. While imports of machinery, goods and apparatus together declined in value in 1926 by over £400,000 as compared with 1925, exports as a whole increased by over £600,000 on the same period. The total values were:—Imports of electrical goods and apparatus, £3,783,000; exports, £13,366,000. Imports of electrical machinery, £1,153,000; exports, £5,817,000. These give a total on the import side of £4,936,000, and one on the export side of over £19,000,000, showing a satisfactory balance in our favour of over £13,000,000. The balance during the previous year was about £12,000,000. It is noteworthy that, whereas imports of electrical machinery in 1926 showed an advance in value of about £68,000 on 1925, there was a decrease in weight, *viz.*, from 4,301 tons in 1925 to 4,264 tons in 1926. On the other hand, while the value of exports of electrical machinery rose from £5,762,000 in 1925 to £5,817,000 in 1926, the weight at the same time rose from 33,216 tons to 34,363 tons. This satisfactory position is indicated in figs. 1 and 2, the latter showing at the same time the proportion of the total value of electrical goods and apparatus taken by the British Dominions.

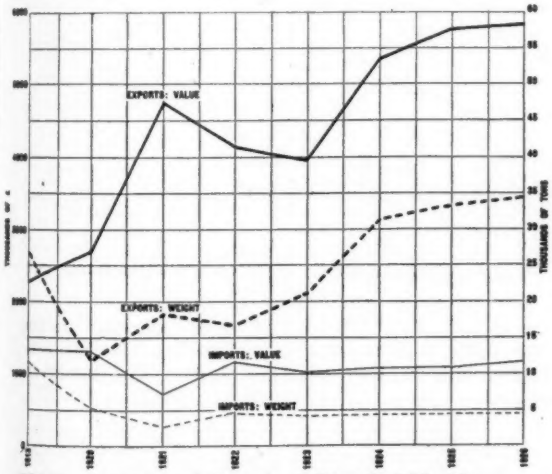


Fig. 1.—Imports and Exports of Electrical Machinery.

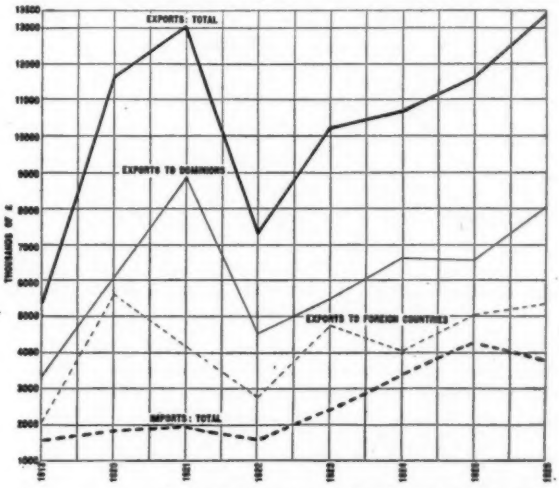


Fig. 2.—Imports and Exports of Electrical Goods and Apparatus.

The exports of traction motors will be seen from fig. 3 to be below both the 1925 and the 1924 level. This was due chiefly to a decline in Latin-American orders, although increased quantities went to British countries. Slight declines also took place in the shipments abroad of other motors, both a.c. and d.c., the total exports of the former being 5,000 tons in weight and £762,000 in value in 1926, compared with 5,450 tons and £807,000 in 1925. A considerable advance is, however, still shown over the 1924 figures, which were 3,640 tons, value £568,900. Exports of d.c. motors were 3,305 tons in weight and £520,000 in value last year, compared with 3,211 tons and £552,000 in 1925, and 2,845 tons and £499,800 in 1924. In the d.c. motor trade last year the British Empire as a whole was the predominant customer, taking plant to the total value of £380,000 out of £520,000. The following table shows our principal customers for generating plant:—

	A.C. GENERATORS. 1924. £	1925. £	1926. £
Total ...	707,800	405,000	557,000
Including to—			
South Africa ...	75,630	94,700	58,000
India	79,160	63,000	138,000
Australia	125,400	41,600	49,000
New Zealand ...	52,300	10,600	7,000
Japan	41,000	15,000	28,000
Canada	14,000	18,000	54,000

	D.C. GENERATORS. 1924. £	1925. £	1926. £
Total ...	544,600	391,500	389,000
Including to—			
India	116,000	81,300	116,000
Australia	104,400	60,000	46,000
South Africa ...	131,100	22,500	37,000
New Zealand ...	6,000	2,600	17,000
Chile	20,000	7,600	19,000

No less than £919,000 (£127,000 more than in 1925) is given as the value of the exports of "electrical machinery not elsewhere specified."

In 1926 more than twice as much electrical machinery was exported to British countries than to foreign

destinations, the respective values being £3,996,000 and £1,821,000 out of the total shipments of £5,817,000. A notable item was rotary convertors, of

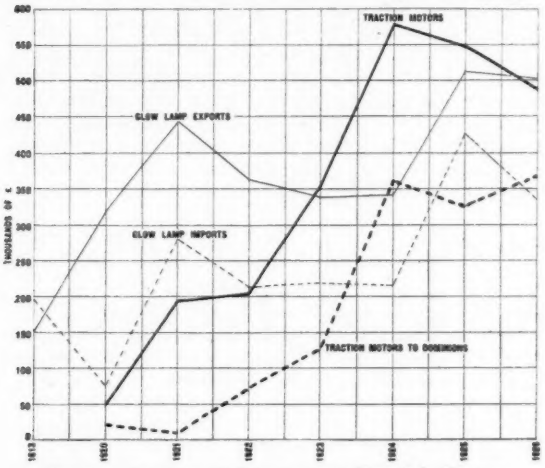


Fig. 3.—Exports of Lamps and Traction Motors.

which £245,000 worth out of a total of £336,600 worth were shipped to the Empire, India being the most important customer.

Of the increase of roughly £1,750,000 in the exports

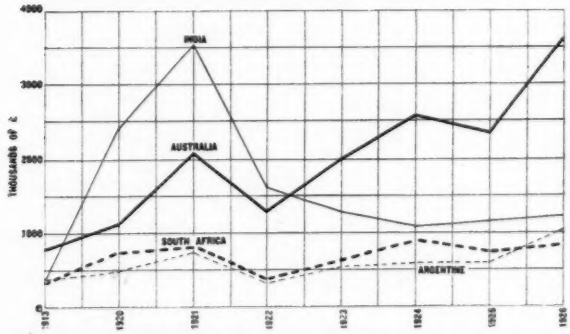


Fig. 4.—Destinations of Exported Electrical Goods and Apparatus.

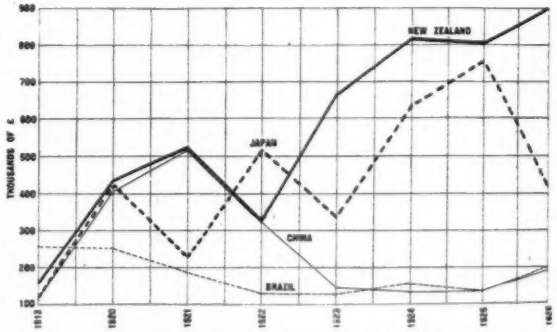


Fig. 5.—Destinations of Exported Electrical Goods and Apparatus.

of electrical goods and apparatus, £1,444,000 was attributable to the market in British countries. This does not apply to submarine cables, of which there

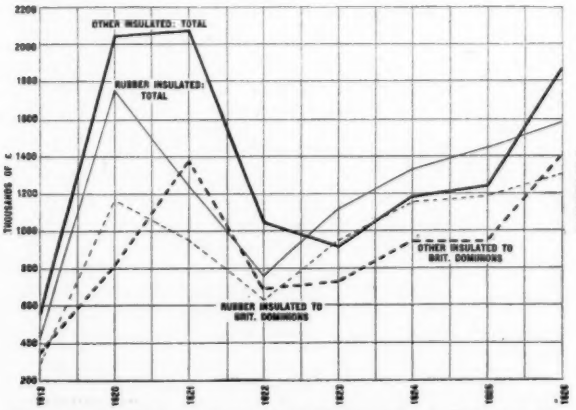


Fig. 6.—Exports of Cable (not Telegraph or Telephone).

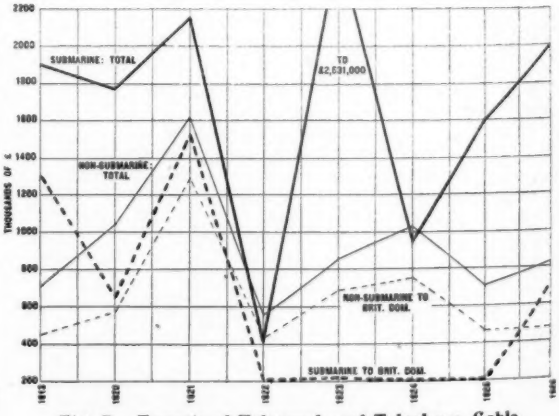


Fig. 7.—Exports of Telegraph and Telephone Cable.

was in 1926 a very large shipment (value £1,173,000) to the United States, and to radio apparatus and other telegraph and telephone apparatus, of which more went to foreign than to British destinations. Our principal customer countries for electrical goods and apparatus are shown in figs. 4 and 5.

Figs. 6 and 7 show how exports in the cable group—which accounted for not far short of one half of the total exports of electrical material other than machinery—continue to show marked progress.

The oversea trade in radio apparatus was well maintained. Exports of such material (not including valves) reached the large total of £1,102,000 in 1926, against £1,106,000 in 1925. The main destinations of this material were:—British countries, £485,000 (including Australia £247,000, India £52,000, South Africa £27,000, and Irish Free State £61,000), and foreign countries £616,000 (including Japan £122,000, Holland £66,000, United States, £21,000, France £39,000, and Brazil £25,000). Japan and Australia were very valuable customers also for other telegraph and telephone instruments, of which Argentina, too, was a notable purchaser in 1926 with a total of £547,000, while Chile figured with £104,000. Shipments of radio valves totalled £170,000, against £183,000, divided more or less equally between British and foreign countries, with Australia the best customer (£50,000), then Japan (£18,000), Sweden (£15,000), South Africa (£9,500), and Canada (£8,000).

In the import and export trade in incandescent lamps the balance has moved still further in favour of this country. From fig. 3 it will be seen that imports in 1926 were less than those in 1925, although above the level of preceding years, and at the same time £166,000 above the exports, whereas in 1925 the difference in favour of exports was only £85,000.

With regard to d.c. motors, which constitute the largest item specified amongst imports of electrical machinery, there was an increase, *viz.*, to £191,800, compared with £132,700 in 1925, thus reversing the tendency seen in that year, when there was a decline compared with 1924 of nearly £27,000. The totals for the past three years, together with the chief supplying countries, are shown below:—

	1924. £	1925. £	1926. £
Total ...	159,500	132,700	191,800
Including from—			
United States ...	107,650	68,900	105,000
Germany	21,100	24,000	19,000
Sweden	5,300	12,700	5,500
Holland	4,000	7,650	3,400
Belgium	2,700	6,300	12,900
Switzerland ...	6,300	3,500	3,800

Imports of a.c. motors were rather greater in value and weight than in 1925, *viz.*, 583 tons, value £88,000, as compared with 550 tons, value £78,600 in 1925, and 568 tons, value £74,400 in 1924. The principal suppliers were Sweden, the United States, and Germany.

There was a small advance in the import trade in generators. The value of a.c. machines was £64,600, against £35,600, but of d.c. generators only £11,900, against £22,320. Switzerland was the only importing country which showed any notable advance in the supply of a.c. generators.

Under unspecified electrical machinery, the total value of imports is given as £728,000, against £711,000, Germany being credited with £11,500 more, Belgium £13,000 more, Switzerland £11,000 less, and the United States—the largest supplier—with as large a share as £268,550, compared with £254,000 the previous year.

Fig. 8 compares the values of imported electrical goods and apparatus from the principal supplying countries in 1926. In the cable group Germany appears with an unusual item of submarine cable—£6,900—while her contribution of radio apparatus was £136,000 in value, as compared with £348,000 in 1925. Austria sent an increased number of incandescent lamps, more, in fact, than Holland, which was at one time the largest supplier. On the whole, it may be said that in the import of electrical goods and apparatus Germany has not improved her position.

Fig. 9 shows the values of electrical machinery imported into Great Britain from the United States, Germany, and Sweden from 1920 to 1926. Next to those three countries the most important suppliers in 1926 were Switzerland (£99,000) and France (£39,800).

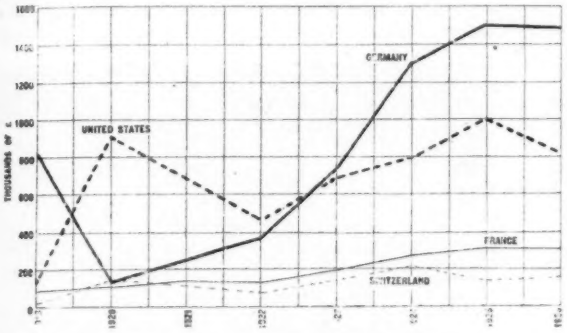


Fig. 8.—Origin of Imported Electrical Goods and Apparatus.

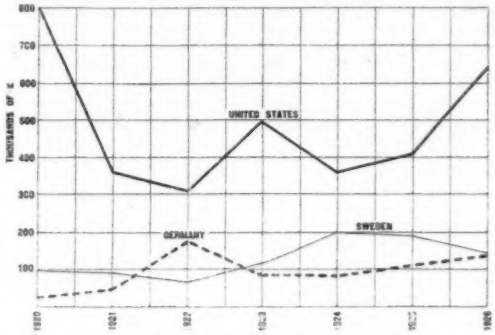


Fig. 9.—Origin of Imported Electrical Machinery.

A New Electric Steel Furnace.

A high-frequency furnace which has recently been installed by Messrs. Edgar Allen & Co., Ltd., Sheffield, is claimed to be the first of its kind in the world to be used for the manufacture of high-grade tool steel.

THE inauguration on December 6th of a new Ajax-Northrup high-frequency electric furnace for the production of high-quality tool steel at the Imperial Works of Messrs. Edgar Allen & Co., Ltd., Sheffield, marks an important step, not only in the development of electric furnaces, but, and perhaps more particularly so, also in the progress of the steel industry. Further, the high-frequency furnace represents a considerable advance in the development of the induction furnace, eliminating the disadvantages of the low-frequency models, due to the necessary introduction of an iron core, and it promises well for the future for metal melting generally.

As already indicated, the importance of the development at the present stage lies in the manufacture of high-grade steel with economy, speed of production, and purity of the metal.

The furnace in question, the first of its kind to be established commercially for its particular purpose, is capable of an output of 20 tons of material per week. It will deal with 450 lb. of steel at one filling, the complete process of melting, from start to finish, taking about one hour.

This type of furnace has been in use in the laboratory for some time, the first to be built in this country being at the present time in Sheffield University. Its principle is probably known generally to electrical engineers, but it may be well to outline it in this article; it was described in a paper read by Mr. D. F. Campbell, M.A., at the autumn meeting this year of the Iron and Steel Institute (ELECTRICAL REVIEW, October 7th, p. 607). In place of the secondary channel of the ordinary induction furnace, eddy currents are induced in the steel itself, before and during melting, in a centrally-placed crucible, a helical inductor coil surrounding the furnace bath. As the heat is actually generated where it is required, the walls of the crucible merely serve the purpose of a container, and no heat is passed from the exterior of the crucible to the metal within. This has an important bearing on the crucible consumption, which is only a fraction of that in an ordinary furnace in which heat is conducted through the crucible to the metal and the external temperature is necessarily much higher than that of the metal. Between the crucible and the coil is a packing of heat-insulating sand which supports the crucible, so that very little mechanical strength is required. The absence of an iron core makes it possible for the furnace bath to be constructed in cylindrical form similarly to an ordinary crucible, which is ideal from the points of view of low heat losses and good metallurgical conditions for the maintenance of refractory linings. The coil is constructed of tubular conductor, and water is circulated through it for cooling purposes. It is suitably insulated, and with the crucible and sand is housed in a wood casing. The whole is mounted in a tilting cradle, so that it is not necessary to remove the crucible for casting.

A view of the actual furnace at Imperial Works is shown in fig. 1. It is installed in the same room as the old coke-oven furnaces, which were used for making the best steel right up to the time the new equipment was installed, and it was particularly interesting to

witness, on the occasion of a recent visit, the production of the metal by both methods side by side.

When the metal is ready for casting the turn-table in front of the furnace is revolved so as to conveniently place, in turn, the ingot moulds under the spout of the crucible. A small electric motor serves, through reduction gear, for tilting the furnace.

Perhaps the most difficult problem with which the designers and manufacturers of the furnace were con-

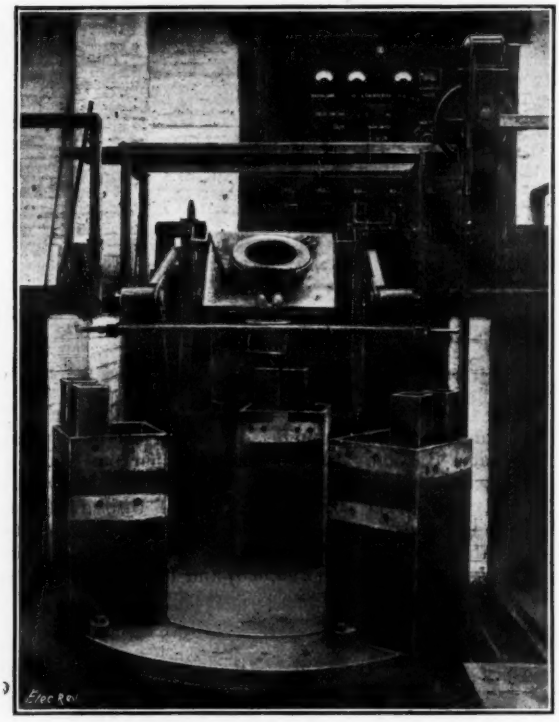


Fig. 1.—High-frequency Electric Steel Furnace.

fronted, in order that it could be put to industrial and commercial use, was to obtain suitable machinery for the production of high-frequency energy. The laboratory apparatus was supplied by complicated generators, involving the use of spark gaps and specially designed condensers and transformers. The production by various manufacturers of high-frequency rotary generators, similar in general appearance to ordinary high-

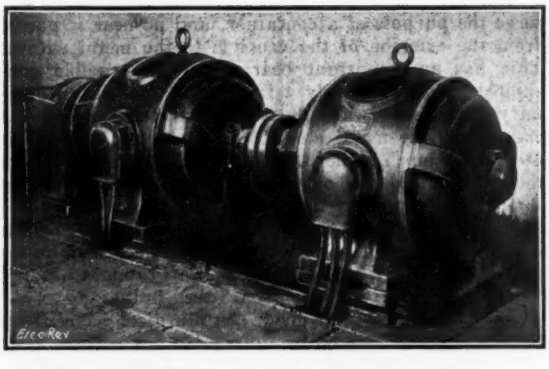


Fig. 2.—Motor-driven High-frequency Alternator.

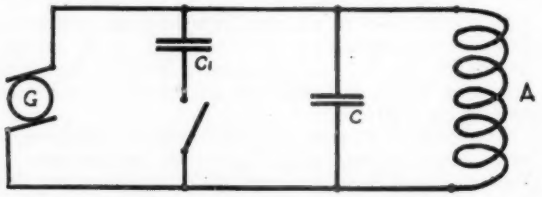
speed machines, has solved the problem. The supply frequency for the furnace in question is 2,200 cycles per second and the pressure 1,200 V, and to meet these conditions the motor-driven generator set shown in fig. 2 has been installed. It is a 150-kW machine, the motor element being supplied from the town mains at 230 V, 50 cycles. The machine runs at 3,000 r.p.m.

It will be realised that the power factor of the furnace itself is very low, and this necessitates the introduction of capacity into the circuit. Further, the power factor varies with the temperature, rendering a variable-capacity control system necessary. Fig. 3 shows the condenser apparatus at Imperial Works, and fig. 4 represents diagrammatically the control circuit. The condenser units are arranged in parallel with the furnace coil, and the capacity and inductance circuit loadings are kept approximately balanced by switching in or out the balancing condenser units. This is done from the control board shown at the back of the furnace in fig. 1, the bottom row of circuit breakers controlling the condenser units. The board is equipped with the necessary

Fig. 3.—Electrical Condenser Bank.

instruments for the component circuits, as well as the necessary main switchgear.

The metallurgical characteristics of the furnace are very interesting, and some operations that were impossible in the past, such as the remelting of stainless steel without the absorption of carbon or sulphur, can now be accomplished. The heating and melting are effected very rapidly, the heat being generated throughout the whole of the charge simultaneously, and not transmitted gradually from the surface. The eddy currents cause a very rapid rotating movement of the molten metal in



A, furnace inductor coil; C, condensers; C_1, balancing condensers G, generator.

Fig. 4.—Diagram of Connections of Control Circuit.

the vertical plane, and some idea of the speed may be gathered from the fact that in a bath of steel 15 in. in diameter the centre of the bath rises more than 1 in. above the metal at the circumference.

It is interesting to note that the power consumption of the high-frequency furnace is about the same as that of the small Héroult arc furnace; the crucibles cost more per ton than the electrodes, but, of course, the great advantage of the newer equipment lies in the fact that the steel is produced under crucible conditions.

It has already been indicated that the new method of

high-quality steel production supplants the old crucible process, which has persisted, with minor modifications, from the time of its invention by Benjamin Huntsman in 1745 down to the present day. It eliminates hard, exacting work, and provides better and less arduous conditions for the worker. A very important point is the much smaller space it occupies. The furnace itself measures 6 ft. 3 in. × 5 ft. 9 in. The space occupied by the furnace, working platform, and switchboard is 15 ft. × 10 ft. The turn-table upon which the ingot moulds are placed occupies a further space of 5 ft. diameter. It is estimated that the new process will operate at a lower cost per ton of steel produced, though this assumption cannot be proved until the furnace has been running for some time.

The furnace was designed and installed by the Electric Furnace Co., Ltd., to which we are indebted for the diagram of the control circuit, and the high-frequency generator set was supplied by the English Electric Co., Ltd.

A New Directional Relay.

A new reverse-current induction-type relay for alternating-current circuits, patented in Great Britain and in several foreign countries by Messrs. Nalder Bros. and Thompson, Ltd., and the author.

By C. L. LIPMAN, A.M.I.E.E.

THE problem of the protection of electrical plant, transmission lines, feeders, &c., against faults, or abnormal conditions, is of growing importance at the present time. A careful study of modern extra-high-voltage practice has revealed the necessity for new and improved protective gear and relays, for experience has shown that the success of any protective scheme depends largely on the reliability and suitability of the relays employed.

When developing his new series of protective relays the author made the operating element of the relay more sensitive and stable, and the tripping mechanism more robust and reliable, his view being that sensitive relays permit lower fault settings to be obtained, are more accurate in calibration, and at the same time consume a smaller amount of volt-amperes for their normal working. Amongst protective relays, the directional type is

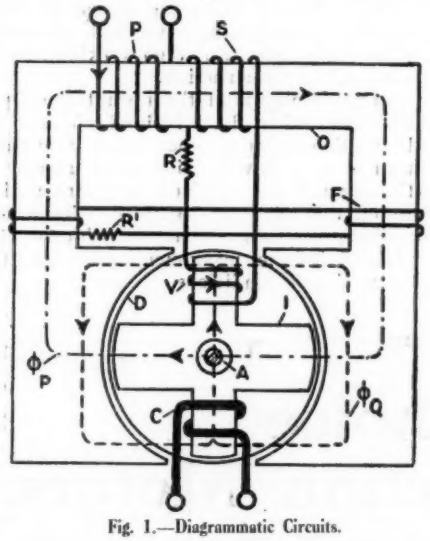


Fig. 1.—Diagrammatic Circuits.

the most important; it covers a wide and varied field of application and, in view of the important improvements which have recently been introduced into this class of apparatus, its uses will undoubtedly be still further extended.

The new device is reliable and sensitive, and offers a satisfactory solution to practically all modern problems involving the use of directional relays. It will select as to the direction of current flow even should the voltage drop to as low as 1 per cent. of the normal, and when properly connected to a 3-phase system it will operate correctly, no matter how abnormal the phase relations between the current and voltage vectors may be during a short circuit.

The magnetic and electric circuits are illustrated in fig. 1: the rotor D is in the form of a cylindrical cup which is free to rotate in the air gap between the poles of internal and external electromagnets I and O, respectively; P is the main potential winding; C the main current winding; V the voltage-compensating winding; F are power-factor compensating windings; R and R^1 are resistances for calibration purposes. It will be noted that coil V is energised inductively from the main potential winding, and that coils F form a closed circuit of their own. The resultant potential flux θ_P circulates along the path indicated by the chain line, thus acting upon the rotor D in a horizontal direction, whilst the flux θ_Q, due partly to the current coil C and partly to coil V, acts upon the drum in a vertical direction, *i.e.*, at 90 geometrical degrees to that of θ_P. The resistance R^1 is so adjusted that the fluxes θ_P and θ_Q are also electrically displaced by 90 time-phase degrees. These conditions being satisfied, a turning moment is exerted upon the moving system by the combined action of fluxes

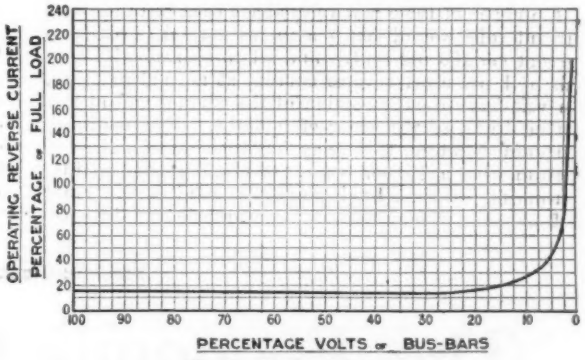


Fig. 2.—Characteristic Curve.

θ_P and θ_Q. The polarity of the coils C and P is such that with forward power they tend to hold the moving system, and with it one of the relay contacts, against a stop, *i.e.*, in the inoperative position.

On a reversal of power the tendency to rotate is in the opposite direction, and if the reversal reaches the value of the reverse-current setting the contacts will close and the relay will operate. The action of coil V is unidirectional, and its effect is to assist, or to oppose, the current coil C according as the flow of current in the controlled circuit is in the forward or reverse direction, respectively. It follows, therefore, that at normal voltage the reversal will increase until it is sufficient to overcome the neutralising effect of coil V before the relay will operate. When, due to a short circuit, the voltage drops, the neutralising effect of coil V is correspondingly reduced, the relay thus becoming more sensitive.

Matters are so adjusted that the energy required to operate the relay decreases proportionately with the voltage, so that the reverse-current calibration, whatever the selected percentage value may be at normal voltage, remains practically constant for all voltages down to about one-sixth of the normal, hence the name "reverse-current relay." The characteristic curve (fig. 2) shows that operation is practically independent of the voltage of the controlled circuit. From the practical point of view, the outstanding feature of the new relay is that this remarkable performance has been achieved without sacrificing sensitiveness at normal voltage, nor at the expense of increased volt-ampere consumption of the windings, nor by the employment of two separate relay elements per pole, an overload and a directional element with their individual sets of contacts connected in series.

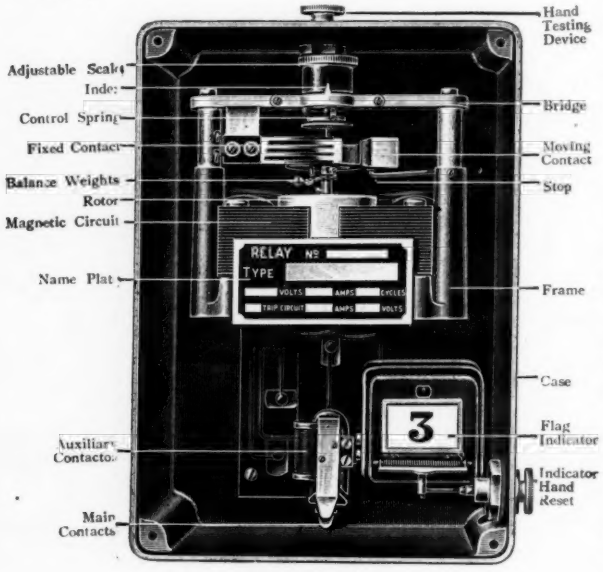


Fig. 3.—The New Relay.

A number of these new relays have been installed with current coils wound for 5 amperes normal (secondary) current (= 100 per cent.), and set to operate with only half of 1 per cent. reverse current at normal pressure, the volt-ampere consumption of the current coil at this setting being of the order of 0.00013. For ordinary purposes, however, this relay has been standardised to operate with a 15 per cent. reverse-current setting, consuming less than 1 volt-ampere at a full-load current of 5 amperes, the volt-ampere consumption of the pressure coil being about 3.5 V-A at 110 volts, 50 cycles. These, and other, points of superiority will be best appreciated by reference to the table of comparative figures for the new induction relay and the now obsolete dynamometer type, both being of the instantaneous pattern wound for 110 volts, 50 cycles, 5 amps., and set for 15 per cent. reversal.

TABLE I.

	Improved induction-type reverse-current relay.	Dynamometer type reverse-current relay.
Volt-ampere consumption of current coil at 5 amps., 50 periods	1	75
Volt-ampere consumption of potential coil at 110 volts, 50 periods	3.5	33
Total V-A consumption ...	4.5	108
Weight of moving system ...	12 gm.	51 gm.
Operation of relay at voltages below 10 per cent. of normal	Stable and reliable.	Oscillating and uncertain.
Accessories	Self-contained.	External resistance box required.

It will be noted that the load which the new relay windings place on the current and voltage transformers is so small that the accuracy of the meter installed in the same circuit is not affected. The new relay has, in fact, been specially designed to work in conjunction with bushing-type current transformers of limited primary ampere-turns, and in this respect it is unique in its applications. The complete relay is illustrated in fig. 3 (with cover removed). It is fitted with an auxiliary contactor of an improved design, the main contacts of which are capable of dealing with a trip circuit up to 2,600 watts, *i.e.*, 10 amperes at 260 volts. The moment the relay contacts close circuit the auxiliary contactor operates and the process of tripping the main switch must go on until the latter is opened. The relay is self-resetting and is fitted with an electrically-operated hand-replaceable flag indicator which gives a positive indication of its having operated; it is also provided with hand-testing and anti-vibration devices, other advantages being high working forces, combined with robust construction.

The standard relay is of the instantaneous pattern, but that illustrated in fig. 3 is fitted with the Nalder-Reyrolle inertia cup which, when loaded with flat disks, introduces a short inverse time-delay action. When sequential operation is required by means of time discrimination, the relay is provided with a time-lag device which gives inverse characteristics for ordinary overloads and definite minimum time characteristics under short-circuit conditions.

The Economic Choice of Induction Motors.

The Importance of Investigating Efficiency before Purchase.

By A. G. POWELL.

THE generation of electricity has been brought to a far higher pitch of efficiency than its utilisation—by which is meant that greater preventable losses occur in its use than in its production. This is, of course, only natural, as the fateful "pounds of coal per unit" figure tells its own tale, whereas no one worries much about the low efficiency which an induction motor may possess, simply because its horse-power output, and probably also its electrical input, cannot readily be measured. Moreover, do not the manufacturers state that it has the "highest efficiency and power factor"? What more can be required?

This is a plea for the choice of consuming apparatus of the highest efficiency (economic efficiency of course), and the induction motor, representing as it does the most important industrial consuming device, seems a good subject to begin with. After all, what is the use of striving for the last one-half per cent. of efficiency in the boiler house if two or three per cent. is thrown away in the installation of motors of relatively low efficiency?

Any induction motor of a certain rating tends to be regarded as a standard piece of apparatus, and the assumption seems to be that the performance of every

make is identical. The induction motor is a very simple and popular piece of apparatus; it is also ideal for mass production, and it can be, and is, produced by many firms as a kind of side line.

It is acknowledged that there may be nothing to choose between the motors made by, say, half-a-dozen reputable manufacturers. It is only reasonable to suppose that a firm manufacturing one article only can make that article a better job than the general manufacturer; moreover, it has to do so in order to justify its existence. The price of the first class of motor may be slightly higher than that of the second, and this difference in first cost must, of course, be considered together with the running costs.

The better motor is not necessarily that with the highest price; but refinements which make for high efficiency, such as a ground rotor, invariably put the price up slightly.

To quote an actual case, the efficiencies of two 10-h.p. squirrel-cage induction motors (a) and (b) were 86.5 per cent. and 83.0 per cent. respectively at three-quarters full load, which is probably the average operating load under working conditions. The cost of (a) was £22, and that of (b) £19 10s. The cost of running (a) eight hours a day, five days per week for a year, is £56 1s. 6d.; and of (b) £58 10s., a saving of 2.4 per cent. by installing (a), and a return of nearly 60 per cent. per annum on the increased cost of motor (a) over that of motor (b).

It can be seen that, of the many different makes on the market, a wide difference in the efficiencies of the product exists, and an investigation into the characteristics of any motor before purchasing will undoubtedly pay.

In this connection it may be mentioned that motor manufacturers seem to be particularly reluctant to state the efficiencies of their wares of the smaller sizes; perhaps it is because they are so seldom asked for these data.

Difference in efficiency has been found to exist to a much greater extent in motors of comparatively small size, but as motors of up to 15 h.p. form probably somewhere in the region of 75 per cent. of the total motor load, the matter is really worthy of more consideration than it at present receives.

Legal.

Messrs. Hailwood & Ackroyd, Ltd., Fined.

AT the Central Criminal Court, on December 9th, Messrs. Hailwood & Ackroyd, Ltd., and their managing director, Mr. E. A. Hailwood, were charged with unlawfully incurring expenses for the promotion of the election of a candidate at the Brixton Parliamentary election in June last without the consent of the candidates' agents (*vide* our issue of November 25th, p. 930). They were fined £10 each and ordered to pay the costs of the prosecution.

Alleged Theft of Dynamos.

BEFORE the Common Serjeant, Sir H. F. Dickens, K.C., at the Central Criminal Court, on December 7th, the hearing was commenced of the case against three men who were charged together with stealing and receiving a large quantity of dynamos and other goods, the property of Messrs. Rotax (Motor Accessories), Ltd. The accused, Arthur E. Fox, fitter, John Farmer, tool setter, and Arthur P. Last, magneto repairer, pleaded not guilty.

Sir TRAVERS HUMPHREYS, prosecuting, said that Messrs. Rotax had a factory at Willesden, and amongst the things they manufactured were dynamos for motor-cars. Every dynamo bore a number and other particulars on it. The defendant Farmer was employed by the company. An enormous quantity of goods had been stolen, and on November 17th last police officers made inquiries of a firm in Praed Street and they there found 26 dynamos. The police were told that they had been bought from the defendant Last for 31s. each; the wholesale price was somewhere in the neighbourhood of £6 10s. The police then interviewed Last, who admitted that he had sold them, and said that he had got them from the defendant Fox. Fox was then interviewed, and he in turn said he had obtained them from the defendant Farmer, and had paid 20s. each for them and had sold them to Last for 25s. each. The police then saw Farmer, who said that he had bought them from a man. He knew that they were taken from the company. After he was arrested, Farmer said he did not steal them, and added that he had 12 other dynamos at his house.

Evidence was then called, and the hearing was adjourned until the following day. After evidence had been given for the prosecution, the Judge directed the jury to find Fox and Last not guilty, and they were accordingly discharged. Farmer was found guilty, and was sentenced to six months' imprisonment in the second division.

Alleged Fraudulent Prospectuses.

THE hearing of the adjourned summonses against Sir Charles Buckworth-Herne-Soame, Bt., Robert G. Harley, and Col. E. O. Eaton was continued at the Mansion House on December 8th. The charges arose out of the issue of prospectuses by the Chalk Fuel Power Gas and By-products Corporation, Ltd., it being alleged that certain statements therein were false.

Evidence was given by Mr. William Hoskins, who said that he was induced by statements in literature received from the Corporation to subscribe £43 15s. for shares. Receiving no dividend, he applied for the return of his cash, but the company wrote putting him off. He had not seen a balance sheet, but he admitted that the company had not claimed to have made large profits, although, at the same time, it did not state that it had made no profits.

Mr. C. W. ADCOCK, the secretary of a printing firm, stated that his principals had, at Col. Eaton's instructions, reprinted an article, "Why Worry About Coal?" 100,000 prospectuses, 100,000 copies of a circular letter, and 100,000 reprints of a newspaper cutting. The Corporation still owed over £200 for the work.

Alderman Sir GEORGE TRUSCOTT decided to commit the defendants for trial at the next sessions of the Central Criminal Court. The defendants pleaded "Not guilty" and reserved their defence. They were released on bail on their own recognisances of £1,000 each.

Wrongful Use of "A.I.E.E."

A MOTION by the Institution of Electrical Engineers against Mr. E. M. Austin, of 142, Farringdon Road, E.C., came before Mr. Justice Romer in the Chancery Division on December 9th.

Mr. GORDON BROWNE, for the plaintiffs, said he asked for an injunction restraining the defendant from using on his stationery, &c., in connection with his business as an electrical engineer, the initials "A.I.E.E.," or any other initials calculated to lead to the belief that he was a member of the plaintiff institution. He understood that the defendant, who appeared in person, was prepared to submit to a perpetual injunction. He (Counsel) therefore asked that the motion should be treated as the trial of the action, and that the defendant should pay the costs.

Mr. AUSTIN said he was prepared to do this.

His Lordship therefore made an order carrying out this arrangement.

Uxbridge and District E.S. Co., Ltd., v. The Minister of Health.

IN the King's Bench Division on December 9th, the Lord Chief Justice and Mr. Justice MacCardie granted an application by the Uxbridge and District Electric Supply Co., Ltd., for a rule calling on the Minister of Health and his inspector to show cause why they should not be prohibited from continuing with a local inquiry. Counsel explained that an inquiry was commenced on December 7th under the direction of the Minister, at Ealing. It appeared that the borough of Ealing had asked for an extension of its boundaries under the Local Government Act, 1888, and the proposals vitally affected the Uxbridge Co. because the date at which it would be compulsorily purchased by the local authority would, it was suggested, be materially altered. The Inspector, however, refused to hear the contention that he had no jurisdiction, but he assumed jurisdiction and proceeded to hear evidence. It was to prohibit him from proceeding and the Minister from making the order that the applicants applied for the rule.

The rule was ordered to go to the Minister of Health, the Inspector and the Ealing Borough Council.

Caerphilly U.D.C. v. Griffin.

ELECTRICITY FROM A PRIVATE SOURCE.

IN the Chancery Division, before Mr. Justice Russell last week, the Caerphilly Urban District Council brought an action against Mr. Victor George Griffin, of Caerphilly, for an injunction to restrain him from supplying electricity within the Council's area of supply. Mr. Griffin, who is a draper and property owner, admitted that he was supplying from his private generating plant electricity for his own business purposes and for sale to Messrs. Woolworth, who had opened new stores in premises built by defendant, and also for the lighting of a market established on his ground. He said he was entitled to do this as his business—following the words of the Electric Lighting Act, 1909—was not primarily that of supplying electrical energy to consumers, and he denied that the lighting of his premises or the supply by him of electrical energy to

tenants or occupiers of parts of his property was in breach of Section 23 of the Act.

Mr. Bennett, K.C. for the U.D.C., said that defendant was distributing electricity which the Act said "shall be unlawful." Defendant was a draper and had a distinct business, and he could not say that because his primary business was that of a draper he was entitled to distribute electricity.

Mr. Gavin Simonds, K.C. for defendant, argued that he was protected by the proviso to the section of the Act which was that the section "shall not prevent any company or person from affording a supply of electrical energy to any other company or person where the business of the company or person affording the supply is not primarily that of the supplying of electrical energy to consumers."

His Lordship, giving judgment, said that the question which he had to answer was: Was the business of Mr. Griffin primarily that of supplying electrical energy to consumers? If it was not, he was within the proviso. In his Lordship's opinion his business was not primarily that of supplying electrical energy to consumers. His business was that of a drapery stores and the developing of his property. In the course of these two businesses he provided plant to light his premises. His supplying of electricity was ancillary to his position as a drapery stores owner and as the owner of property. Whatever the results might be to local authorities, the action failed and must be dismissed with costs.

Fraudulent Consumption of Electricity.

At Blackburn on December 7th, a fine of £5 was imposed on William J. J. Neale, of 35, Great Harwood, for the fraudulent consumption of electricity belonging to the Blackburn Corporation Electricity Department.

Mr. C. S. Robinson, solicitor to the Corporation, said that the defendant was originally supplied with a lighting meter and later his application for power for an electric iron and fire was granted, and a second meter was installed. Electricity for domestic lighting cost 6½d. per unit and for domestic power 1½d. An inspector visited the house and found that whilst the power meter had registered 32 kWh, none was registered on the lighting meter. He asked for the lights to be switched on, and it was then found that there was an additional light suspended from the ceiling attached by flex to the power meter. Defendant said that something went wrong with the ordinary light, and the flex was put up temporarily to afford illumination.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The Christmas Holidays.

Owing to the Christmas Holidays it will be necessary for the issue of the Electrical Review for December 23rd to appear one day earlier than usual, and for that of December 30th to be published one day later than usual.

Our contributors to all editorial sections are asked to bear these alterations in mind, especially in the case of the December 23rd issue. All matter must be in our hands very promptly for that Review.

We would direct the attention of advertisers and all who are responsible for the preparation of advertising copy, to the notice appearing in our advertising pages to-day, in which the latest times for the receipt of matter and blocks for December 30th issue are stated.

Electrical Review Index.

The Index to Vol. CI (for the half-year ending December 31st, 1927) will be published shortly, and we shall be glad to receive the names and addresses of those who require it (free of charge) for binding purposes or wish to retain it for reference. Application should be made as early as possible to the Publisher, 4, Ludgate Hill, E.C.

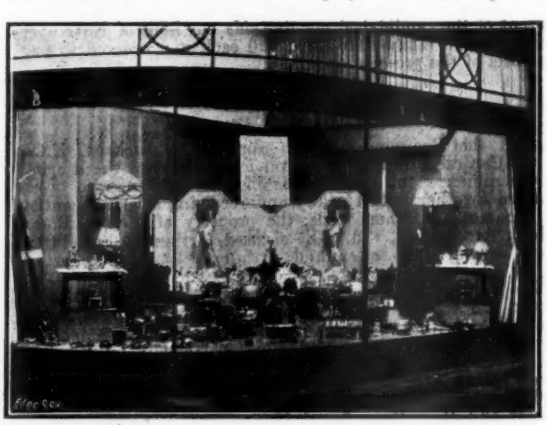
E.D.A. Circle Campaign.

The latest progress report from the Electrical Development Association records the formation of a Circle at Blackpool under the chairmanship of Mr. C. Furness, the borough electrical engineer. This makes the total number of Circles 107. In addition to the 68 demonstration houses and exhibitions already notified, others have been arranged in the following districts:—Tottenham (North Metropolitan E.P.S. Co.), Sevenoaks (Messrs. Strange & Sons), Saffron Walden, Eastbourne (Messrs. H. Beney & Sons), Gloucester (Radia Electrical Co.), and Guisborough. The lecturers and lecture secretaries now number 200. The names are given of 21 additional supply undertakings which had agreed to supply free electricity for the special window display during National Electric Week. The number of electrical shops using the special display during the Week was 720. Appropriate E.D.A. advertisements appeared in 230 newspapers and composite electrical pages were published in 38 towns; in many cases three or four were published in one town. Over 300 lengthy newspaper articles have been remitted to the Association. Brief reports of special activities have been received from many parts of the country. The organisers hope to publish a full report of National Electric Week shortly.

National Electric Week was observed throughout Scotland, local Circles being very active. Ward committees, clubs, and 300 apprentices in the electrical industry visited the Glasgow Corporation generating station at Dalmarnock. A cooking demonstration was given by Miss Anna Holm, Newcastle, in Charing Cross Hall, to a large audience. All the manufacturers' and dealers' premises in Glasgow were tastefully decorated, and with their special lighting effects attracted much attention. The General Electric Co., Ltd., and Metro-Vick Supplies, Ltd., had special displays, the former making a fine show with its "Magnet" labour-saving appliances, while the latter had Christmas trees showing the excellent effects of colour in lighting, and a large assortment of lamp shades.

We have received from Mr. W. Blair Smith, the municipal electrical engineer of Paisley, a report of the activities of the Paisley Circle. The handicap of limited window space has had to be surmounted by extra efforts in other directions. A great deal of "literature" has been distributed, and several public lectures on electrical matters have been delivered under the auspices of the Paisley Association of Electrical Engineers. Good work has also been done by practical demonstrations in the shape of all-electric houses. The best advertisement for electricity is the all-electric street lighting, which is carried out by means of spherical opalescent globes, giving a plentiful and uniform illumination. Special street-lighting cables have been laid in every thoroughfare, and by a system of relays the whole of the street lighting of the burgh is controlled by five small switches at the power station. Much has also been done by the Electricity Department in the wiring of tenement houses.

As will be seen from the accompanying illustration, the Croydon Electricity Department employed two of the special National Electric Week window displays and linked up with

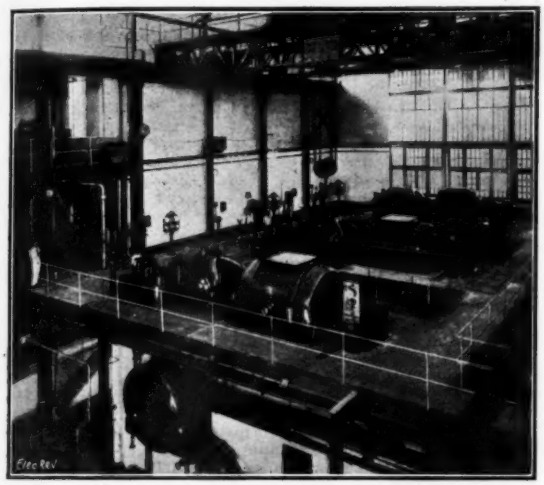


The Croydon National Electric Week Display.

them a whole host of domestic appliances. The display should lead to the sale of many electrical Christmas gifts, while extra inducement lies in the attractive rates of charge in Croydon.

Recent Contracts.

Recent contracts placed with the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., include a number of important overseas orders for turbo-alternator sets. The destinations include Shanghai, Melbourne, Singapore, Calcutta and Colombo. The order for Shanghai is for a 20,000-kW set, with condenser, for the Riverside power station of the Municipal Council; it is a duplicate of the last set installed, and the third set of this capacity to be supplied by the company for the power station. It will raise the plant capacity to over 160,000 kW. A 12,500-kW turbo-alternator set has been ordered for the Yallourn power station, Melbourne, where five Metro-Vick sets of this capacity are already in operation. As in the case of the sets already installed, the condenser for the new set will be constructed in Australia by Messrs. Thompsons Engineering and Pipe Co., Ltd., to the design of the Metropolitan-Vickers company. The Calcutta Electric Supply Corporation, Ltd., has ordered a 12,500-kW turbo-alternator set with condenser for the Cossipore power station. The Singapore power station is of comparatively recent but rapid development. The existing plant, shown in the accompanying illustration, consists of two 5,000-kW and one 2,000-kW M.-V. sets, and a new set of 10,000-kW capacity has now been ordered by the Municipal Commissioners. On behalf of the Ceylon Government the Crown Agents for the Colonies have placed orders which cover the complete equipment of a new power station which is to be built at Kolonnawa, near Colombo. The initial plant is to consist of two 3,000-kW turbo-alternator sets and the orders include the supply of condensing plant, switchgear, auxiliary transformers, crane, and boiler plant, the last being supplied by Messrs. BABCOCK & WILCOX, LTD., as sub-contractors. Generating plant in course of manufacture at the Metropolitan-Vickers works ranges from sets with single alternators of 55,000-kVA capacity for large power stations, down to sets of 100 kW for industrial applications.



Metropolitan-Vickers Plant at Singapore.

Unemployment in Germany.

The Berlin correspondent of *The Times* reports that between November 15th and 30th the number of unemployed in receipt of relief in Germany, under the new insurance system, rose from 395,000 to 605,000, an increase of 53 per cent. The number of unemployed in receipt of extended benefits rose from 126,000 to 147,000, making the total on November 30th 752,000, as compared with 1,369,000 on November 30th, 1926.

Swiss Electrical Exports.

The exports of electrical machinery from Switzerland during the nine months ended September last attained a value of £788,126. Spain, Rumania and Italy are at present the principal foreign markets for Swiss dynamos, while Egypt, France, and Great Britain lead as regards electric motors.

New Belgian Electrical Association.

With the title of the Union Belge des Producteurs d'Electricité, a new co-operative association has just been formed in Brussels, the object generally being to inquire into and carry out methods of encouraging the production and transmission of electricity in Belgium. In particular the Union will encourage the formation of regional groups of electric power generating stations to eventually include the consumers, participate in the establishment of large power stations, and plan, create, and exploit, either alone, or in conjunction with other organisations, distribution systems connecting the difference regional groups, and organise power exchange systems between them. Twelve Belgian electric power undertakings, the Brussels Tramway Co., and the municipal authorities of Liége and Ghent have become members of the Union.

Our Foreign Electrical Trade.

The following were the values of imports and exports of goods and machinery during November:—

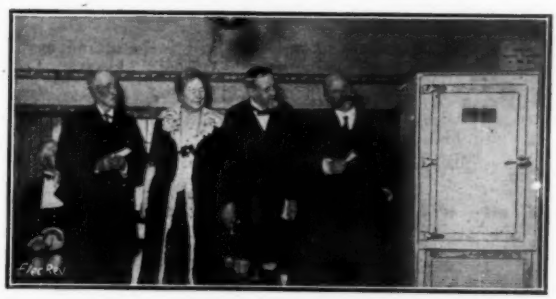
	November, 1927.	Inc. or dec. as compared with Nov., 1926.	Eleven months, 1927. inc. or dec.
Imports—	£	£	£
Electrical goods and apparatus ...	475,335	+ 37,465	+ 422,783
Machinery	1,359,663	+ 182,781	+2,795,423
Electrical machinery	127,645	+ 39,637	+ 443,454
Exports—			
Electrical goods and apparatus ...	1,152,601	+ 21,917	− 268,595
Machinery	5,439,641	+1,441,288	+3,938,920
Electrical machinery	618,377	+ 23,840	+ 917,190
Re-exports—			
Electrical goods and apparatus ...	13,934	+ 518	− 26,241
Machinery	141,699	+ 44,843	+ 123,032
Electrical machinery	14,162	+ 7,019	+ 27,436

The Marking of Imported Copper Wire.

The Board of Trade has referred to the Standing Committee, appointed under the Merchandise Marks Act, applications for Orders-in-Council to require the marking of imported copper plates, sheets and strips, and copper wire, sheet lead and lead pipes, and other articles. The Committee will consider whether these articles should be marked on sale or exposure for sale, and it may at its discretion also consider whether the articles should be marked on importation. The date of the Committee's public inquiries into these applications will be announced later, and any communications regarding them should be addressed to the secretary, Mr. E. W. Reardon, New Public Offices, Great George Street, S.W.1, not later than December 31st.

A Golden Wedding Gift.

Upon the occasion of the celebration of their golden wedding recently the Marquis and Marchioness of Aberdeen and Temair were presented with a "Kelvinator" automatic electric refrigerator by the Cromar, Upper Dee and Donside Agricultural Association. The presentation was a remarkable proof of the far-reaching effects of electrical propaganda, for in the district concerned electricity, other than that in local mansions, is practically unknown. The accompanying picture shows the actual presentation by the Provosts of Tarland and Upper Dee. Mr. E. R. Morton, the sales manager of Kelvinator, Ltd., attended the ceremony.



Presentation of a "Kelvinator" to the Marquis of Aberdeen.

Book Notices.

The "Practical Engineer" Electrical Pocket Book and Diary for 1928. Edited by Conrad Arnold, A.M.I.E.E. Pp. 643; fully illustrated. London: Humphrey Milford. Price, cloth cover, 2s. 6d. net; leather cloth cover, 3s. net.—A feature of the new edition of this handbook, which has been brought up-to-date generally, is the revision and amplification of the sections relating to electrical instruments, by Col. K. Edgcumbe, M.I.E.E. The wind pressure table for overhead conductors has been recalculated so as to bring it into line with the Regulations for Overhead Lines, 1924, of the Electricity Commissioners.

Scientific Papers of the U.S.A. Bureau of Standards. Vol. 22, No. 556—"Current Distribution in Supraconductors." (10 cents.)

"Wireless Direction Finding and Directional Reception," by R. Keen (second and enlarged edition). Pp. vi+490; figs. 329. London: Iliffe & Sons, Ltd. Price 21s. net.

"Electric Control Gear and Industrial Electrification," by W. Wilson. Pp. xiii+361; figs. 216. London: H. Milford, Oxford University Press. Price 25s. net.

"Britain's Fuel Problems." Pp. xvi+592 and supplement; illustrated. London: The Fuel Economist. Price 42s. net.

Carliol House Opened.

On December 5th Carliol House, the new headquarters of the Newcastle-upon-Tyne Electric Supply Co., Ltd., was officially opened. The new premises have a present frontage of 270 ft., and will eventually be extended to 350 ft. Every convenience for the company, its staff, and customers has been installed. We reproduced a view of the exterior in our issue of October 21st (p. 698), and we hope to publish a description of Carliol House in a forthcoming issue.

Trade Announcements.

Messrs. POOLEY & AUSTIN, 34, Broadway, Westminster, S.W.1, have been appointed sole agents in London and the South of England for the "Lawson" mercury-motor electricity meter. They have sent us an illustrated pamphlet dealing with the device.

Messrs. W. F. DENNIS & Co., 70, Queen Victoria Street, E.C.4, have been appointed sole representatives in Great Britain, Northern Ireland, and the Irish Free State for Messrs. Heckel Company, Ltd., Saarbrucken, manufacturers of haulage and conveyor plants, aerial ropeways, &c.

The firm has also received the sole distributing agency in Great Britain, Northern Ireland, and the Irish Free State for the complete range of "Tekade" radio valves.

Mr. F. J. OLIVER has severed his connection with the British Thomson-Houston Co., Ltd., of Mazda House, Newman Street, W., with whom he has been for the past 14 years, and has commenced business on his own account as an electrical factor at 3, St. George's Avenue, Aldermanbury, London, E.C. He wishes to receive catalogues.

MESSRS. FITTER & POULTON, LTD., have removed to more suitable premises at Vincent Parade, Balsall Heath, Birmingham. Telephone: Midland 1994.

Messrs. J. L. ETHERIDGE & Co., electrical engineers, have opened an electrical and wireless depôt at 6, Woolcomber Street, Dover.

New Catalogues and Lists.

THE PREMIER ACCUMULATOR CO. (1921), LTD., Northampton.—Lists O., C.2 and W.2, dealing, respectively, with the company's batteries for cars, country-house lighting, and radio work. Fully illustrated and priced.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—The "Osram Bulletin" for November, a special Christmas trade number dealing with window displays and other means of selling the company's products. There are also interesting illustrated articles on various G.E.C. appliances.

THE SUN ELECTRICAL CO., LTD., 118-120, Charing Cross Road, W.C.2.—List No. 484, containing a number of suggestions for Christmas gifts—electrical and radio. Each item is illustrated and prices are given.

THE FALKIRK IRON CO., LTD., Falkirk.—Home and export price lists of the company's "Livecoal" electric fires. Illustrated.

MESSRS. G. S. PECKHAM & Co., 4 & 5, New Compton Street, W.C.2.—An illustrated and priced pamphlet describing the new improved "L.P." lamp lock.

THE HOTPOINT ELECTRIC APPLIANCE CO., LTD., 24, Newman Street, W.1.—A pamphlet dealing with the merits of "Hotpoint" immersion heaters (priced), accompanied by a report of tests carried out by the Glasgow Electricity Department, in the course of which the sample was raised to red heat in air four times, and each time plunged into cold water without damage to the elements.

ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI, Victoria Street, S.W.1.—December stock list of dynamos and motors.

MESSRS. DAVEY, PAXMAN & Co., LTD., Colchester.—A profusely illustrated brochure containing full descriptions of several of the company's heavy fuel oil engines.

THE EVER-READY CO. (GREAT BRITAIN), LTD., Hercules Place, Holloway, N.7.—A red and white poster announcing the introduction of a new series of h.t. and grid bias dry batteries.

MESSRS. FERRANTI, LTD., Hollinwood, Lancs.—Pamphlet Ta 162, containing an illustrated article on "A.C. Voltage Regulation" by Mr. G. L. Porter, advisory engineer to the company.

THE BRITISH ALUMINIUM CO., LTD., Adelaide House, King William Street, E.C.4.—A booklet containing 35 illustrations of typical aluminium overhead lines in many parts of the world.

SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., 38-39, Upper Thames Street, E.C.4.—December price sheet containing illustrated particulars of a wide range of electrical products.

MESSRS. C. A. V. VANDERVELL & Co., LTD., Acton, W.3.—A well-illustrated and priced catalogue of electrical equipment for commercial venicles.

PHILIPS LAMPS, LTD., 145, Charing Cross Road, W.C.2.—An illustrated and priced folder advertising the company's electric candlestick.

A.F.A. ACCUMULATORS, LTD., 120, Tottenham Court Road, W.1.—A series of illustrated price lists of "Varta" high- and low-tension accumulators and rectifiers.

MESSRS. D. J. PATTON, LTD., Colwell Works, Colwell Road, East Dulwich, S.E.22.—A calendar-blotter advertising the company's insulating materials.

METRO-VICK SUPPLIES, LTD., Trafford Park, Manchester.—An illustrated and priced booklet putting forward a number of domestic electrical appliances as suitable Christmas presents.

ELECTRICAL EQUIPMENT & CARBON CO., LTD., 109-111, New Oxford Street, W.C.1.—Monthly stock list of motors, dynamos, and electrical materials.

MESSRS. VERITYS, LTD., Aston, Birmingham.—Two illustrated and priced publications dealing, respectively, with "Maxlume" industrial and commercial lighting, and fans of various patterns.

MESSRS. GRIERSON, LTD., 43, Bloomsbury Square, W.C.1.—A well-printed brochure containing a description of the company's "Dulray" electric panel heating system, with illustrations of actual installations.

Bankruptcy Proceedings.

F. H. THOMAS and W. E. EVANS (Thomas & Evans), electrical engineers, Salubrious Chambers, Salubrious Passage, Swansea.—Last day for proofs for dividend, December 24th. Trustee, Mr. H. Rees, Official Receiver, Government Buildings, St. Mary's Street, Swansea.

J. R. HEREFORD-LAVEY and V. DE FRECE (Radio Cash Stores), electricians, 371, Upper Street, N., 5, New Station Street, Leeds, and Parliament Street, Nottingham.—Last day for proofs for dividend December 21st. Trustee, Mr. C. Latham, 78, New Oxford Street, W.C.1.

J. V. FIGGINS (V. Figgins), plumber, sanitary and electrical engineer, 97, Fore Street, St. Marychurch, Torquay.—Trustee, Mr. W. R. Cocks, Official Receiver, Exeter Bank Chambers, 67, High Street, Exeter, released November 23rd.

T. W. DOUST, electrical engineer, &c., Shamrock House, Ramsgate, Louth, late of Mablethorpe.—Receiving order made December 6th, on debtor's own petition.

A. B. HAWKINS and H. HAWKINS (Hawkins Bros.), electrical engineers, 101, Station Hill, Kidderminster.—Trustee, Mr. A. M. Fairbairn, Official Receiver, 1, Priory Street, Dudley, released November 28th.

Company Liquidations.

GRANT, MERCHANT & Co., LTD., 4, Duke Street, Adelphi, W.C.—The first meetings of the creditors and shareholders under the compulsory liquidation of this company were held on December 7th, at the Board of Trade Offices, Carey Street, Lincoln's Inn, W.C. The company was registered as a private one on February 12th, 1925, with a nominal capital of £1,000, to take over as a going concern the business of Grant, Merchant & Co., electrical advertising sign manufacturers. The consideration payable by the company was partly, as to £200, in shares, and the balance as to the acceptance and discharge by the company of all outstanding liabilities of the business. The liabilities taken over amounted to £336. No statement of affairs had been filed, but, according to a list of the creditors, the total liabilities of the company amount to £2,792, and the assets are valued at about £256. Two classes of signs have been dealt in by the company, *viz.*, flashing signs and bottle pouring signs. The failure is attributed partly to the coal dispute and its consequences, in that the restrictions placed upon the consumption of electricity prohibited the use of electric signs of any description. The liquidation was left with the Official Receiver.

RADIO COMPONENTS, LTD., 19, Rathbone Place, London, W.—A meeting of creditors was held on December 5th, at the offices of Messrs. Oldham, Holland & Co., 17, Coleman Street, E.C. The statement of affairs presented disclosed liabilities of £900, and the assets, after allowing £16 for preferential claims, and £6 for secured creditors, totalled £95, leaving a deficiency of £805. The company was formed in September, 1922, with a nominal capital of £2,000. The profit had never been sufficient to cover the overhead expenses. No resolutions were passed, and therefore the voluntary liquidation of the company will be continued with the present liquidator. The creditors include:—

	£		£
Igranic Electric Co., Ltd.	330	Hunt, A. H., Ltd. ...	86
Sel Ezi Wireless Supply Co.	32	Bankers	299

LIGHTING COMPONENTS, LTD.—Winding up voluntarily. Liquidator, Mr. J. Todd, 18, Birley Street, Blackpool.

ELECTRICAL WHOLESALE SUPPLIES (LEICESTER), LTD.—A meeting of members is called for January 19th, at the offices of Messrs. Hopps & Bankart, 70, Woodgate, Loughborough, to hear an account of the winding up from the liquidator, Mr. J. A. Hopps.

VICTORIA ELECTRICAL (MANCHESTER), LTD.—A meeting of members is called for January 10th, at 6, Princess Street, Manchester, to hear an account of the winding up from the liquidator, Mr. R. Norman Brookes.

AUSTIN LIGHTING CO., LTD.—A meeting of creditors is called for December 16th, at the offices of the company, Banbury, Oxon. Liquidator, Mr. S. R. Worley.

NEUTRON, LTD.—Last day for proofs for dividend December 23rd. Liquidator, Mr. M. D. Booth, 40-43, Norfolk Street, W.C.

Registered Electrical Contractors.

At the last meeting of the Executive Committee of the National Register of Electrical Installation Contractors applications by the following for registration were accepted:—

Sackville Electrical Co., Bradford.
Francis, T., & Sons, Bolton.
Spreadborough, W., West Didsbury, Manchester.
Weald Electricity Supply Co., Ltd., Crowborough.

Calendars and Diaries.

A beautiful view of Crackendale, Derbyshire, is the subject of the D.P. BATTERY CO.'s 1928 calendar. Beneath the picture are monthly date slips.

The calendar sent us by BRITISH INSULATED CABLES, LTD., consists of monthly cards figured white on black in a metal stand-up frame. Data relating to v.i.r. and p.i.l.c. cables flank and calendar.

The usual chaste design in gold is employed in the 1928 calendar of the NORTH METROPOLITAN ELECTRIC POWER SUPPLY CO. At the head is a view of the new Brimsdown station, and there are weekly date slips, each bearing a miniature calendar for the month.

Mr. CHARLES SELZ has again sent us one of his diaries. This is a neat pocket book bound in black leatherette with interior pockets and an insurance coupon.

Barribal's "Exide" girl again appears on the 1928 calendar of the CHLORIDE ELECTRICAL STORAGE CO., LTD. The calendar is equipped with monthly date slips.

The ARORA CO., of Rosebery Street, Loughborough, has sent us a neat and handy vest-pocket diary and note book for 1928, with insurance coupon.

From Messrs. C. A. PARSONS & CO., LTD., of Newcastle-on-Tyne, we have received a wall calendar with monthly sheets, each bearing an excellent sketch of some plant construction or testing operation in progress in their works.

The Timber Trade.

Our Timber Trade Correspondent reports that the demand for European soft building woods has been fair only during the past month, due to the seasonal decline in building trade work, which has been more noticeable this autumn than last. Stocks on the market generally are large, although much is unavailable for consumption at congested docks. Prices have been weak, but are gradually improving, and should stiffen up during the first quarter of 1928, when the shipping season will be closed. Hardwoods of good class varieties are firm in value, especially mahogany and teak, but American sawn woods are weak, both in demand, compared with stocks, and price. The latter, on account of large supplies coming to hand month by month on an already overstocked market. Plywood is moving off fairly satisfactorily into consumption, in various grades, to meet all requirements and purses.

New Australian Tariffs.

A number of amendments to the Commonwealth Customs Tariff have been presented to the Federal Parliament. Where these increase the duty they became operative on November 25th; reductions in duty will only come into force after final ratification. Some of the articles affected are mentioned below:—The new rates on railway and tramway rails weighing 50 lb. per yard or over are £2 10s. per ton under the British preferential tariff, £4 5s. under the intermediate tariff, and £5 under the general tariff. For electrical household floor polishers, ironing machines and hair dryers, the rates are free, 15 per cent. *ad valorem*, and 25 per cent. The duties on electric household dish-washing machines are the same, but deferred duties (to operate at any future date determined by the Minister for Trade and Customs) of 45 per cent., 55 per cent., and 60 per cent. are provided for. Telephones, telephone switchboards, distributing boards and appliances, are admitted free under the British preferential tariff, but are dutiable at 15 and 20 per cent. respectively under the intermediate and general heads. Storage batteries, suitable for use in motor-cars otherwise than for propulsion purposes, are subject to duties of 35 per cent., 47½ per cent., and 60 per cent. respectively. Horns, warning devices n.e.i., reflectors and reflex rear lights for use on bicycles or motor and other vehicles are admitted free under the British rate, and are subject to duties of 15 and 25 per cent. under the other heads.

A Symbol of Service.

The Shropshire, Worcestershire and Staffordshire Electric Power Co. has sent us one of the posters which it is now using freely in its area of supply. It introduces "General Utility," a martial figure wearing an electric-lamp bearskin, and armed with a forked-lightning sword.

Unemployment.

During the week ended November 28th there was a further rise of 18,950 in the number of unemployed. The total at that date was 1,145,200, as compared with 1,126,250 on November 21st and 1,496,070 on November 29th, 1926.

Exhibitors at the Birmingham Fair.

In addition to those whose names we have already published, the following firms are exhibiting electrical or allied products at the 1928 British Industries Fair at Birmingham:—

S. G. Brown, Ltd.
H. E. Ashdown (Birmingham), Ltd
F. Turner, Birmingham.
Eastern Telegraph Co., Ltd.
Wingrove & Son.
Siluminite Insulator Co., Ltd.
Burnley Components, Ltd.
Watertight Fittings Co., Ltd.
Holden & Hunt, Ltd.
J. A. Brook, Huddersfield.

Lamp Production in Holland.

It is stated that the factories of the Philips Glowlamp Works are very briskly employed, and that over 1,000 additional hands were engaged in October, the total number now being 11,000.

The Electrical Imports of Mozambique.

According to the *Board of Trade Journal*, during 1926 65 tons of electrical apparatus, valued at £13,194, was imported into the province of Mozambique, Portuguese East Africa. The principal sources of supply were the United Kingdom, South Africa, and Germany.

For Sale.

Plymouth Corporation Electricity Department invites offers for five Lancashire boilers and fittings. Messrs. Fuller, Horsey, Sons & Cassell invite offers for one 300-kW generating set, now lying at Wembley. (See our advertisement pages to-day.)

The Annual Companies Report.

The report upon companies by the Board of Trade for the year 1926 shows that 7,803 companies were registered during that period. Companies removed from the register numbered 1,480 (including 9 under Section 4 of the Trading with the Enemy (Amendment) Act, 1918), and 2,732 went into liquidation, making a net increase of 3,591. Although the number of registrations was smaller than in 1925 (8,035), there was a large increase in the total nominal capital—from £123,187,323 to £203,583,518, or an average of £26,090 per company (against £15,331). In Scotland 485 companies, with a total capital of £10,781,900. were registered, as compared with 494 and £9,015,285 in 1925. As usual, the largest number of companies (3,242) had capital ranging from £1,000 to £5,000; there were 20 with a capital of £1,000,000 or more (against 15 in 1925). Of the 8,288 companies registered in England and Scotland 7,742 were "private." The number of operative compulsory winding-up orders made by the Court was 231, and public examinations were ordered in 7 cases.

The total number of companies in England and Scotland, with a share capital, on the register at December 31st, 1926, was 97,588, and their aggregate paid-up capital was £4,636,613,382. During 1926 there were 15,561 applications for registration under the Business Names Act in England and Scotland, and 27 limited partnerships were registered.

New Zealand Hydro-Electric Scheme.

The agreement between the Government and Sir W. G. Armstrong-Whitworth & Co., Ltd., regarding the Arapuni contract dispute provides that the contractors shall finish No. 1 section of the contract, which includes the dam and headworks. Section No. 2, which includes the power-house and other works, will be completed by the Government. The contractors will receive payment according to schedule rates for work already done, and an additional sum of £30,000 to cover the cost of the preliminary and temporary work of which the Government will have the benefit.—*Reuter* (Wellington).

The Marking of Imported Cables.

On Monday and Tuesday of this week the Board of Trade Standing Committee considered an application under the Merchandise Marks Act for an Order-in-Council requiring the marking of imported insulated electric cables and wires with the name of the country of origin. The applicant was the Cable Makers' Association, and opposition was presented by the Electrical Importers' and Traders' Association. Mr. Ll. B. Atkinson, director of the C.M.A., was the principal witness, and his evidence was directed to the difficulty of distinguishing between British and foreign cables. He claimed that marking would be a simple and inexpensive matter. A report of the proceedings will appear in our next issue.

The Berlin Commercial Secretariat.

The Department of Overseas Trade states that the address of the British Commercial Secretaries for Germany (Mr. J. W. F. Thelwall, M.C., and Mr. C. J. Kavanagh) is now:—Tiergartenstrasse 17, Berlin, W.10.

Social Events.

The staff of the Bow Generating Station of the Charing Cross Electricity Supply Co. Ltd., held their annual dinner at Gatti's Restaurant on December 8th. Mr. John Gatti, chairman of the L.C.C. and managing director of the company, presided over a very happy gathering.

The Ladies' Physical Training Section, collaborating with the Ladies' Netball Section of the G.E.C. Social and Athletic Club, held a successful dance at Magnet House, Kingsway, on November 25th. The organisers were Miss Finn and Miss Cox, to whose efforts much of the success of the enjoyable evening was due.

The presentation of the "Wilson" and "Byng" Tennis Challenge Cups, offered for competition between the various G.E.C. London establishments, took place on November 26th. The winners of both cups this year are attached to Messrs. Fraser & Chalmers, Erith. The occasion was marked by an informal dinner, after which the members of the various tennis clubs who had taken part in the competitions entertained the gathering.

All-Electric Houses in the Midlands.

Demonstrations in all-electric houses are being given in Birmingham, Solihull (a suburb) and West Bromwich. In the finely-equipped house in Bristol Road, Birmingham, demonstrations of electric cooking, heating and lighting are given daily, while an electric laundry has been fitted up to show how the usual domestic washing can be dealt with. In the course of the next few weeks it is hoped to open other demonstration houses in other parts of Birmingham. Electric cookers, washing machines, irons, wash boilers, fires, and the latest fittings will be among the apparatus on view.

New Indian Company.

A company has recently been formed in Trichinopoly (Madras) with a capital of 300,000 rupees and the title Sri Meenakeshi Sundharesawatel Electric Power Corporation.

Prices of Raw Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.		Price December 13th	Fortnight's inc. or dec.
a	Acid, Oxalic	per lb.	5¾d.	...
a	Ammoniac, Sal	per ton.	£60	...
a	Ammonia, Muriate (large crystal)	,,	£52	...
a	Bisulphide of Carbon	,,	...	...
a	Borax	,,	£25	...
a	Copper Sulphate	,,	£25 10s.	...
a	Potash, Chlorate	per lb.	3½d. to 4d.	...
a	,, Perchlorate	,,	5½d.	...
a	Shellac	per cwt.	£13 10s.	...
a	Sulphur, Commercial	,,	£11	...
a	,, Roll	,,	£11	...
a	Soda, Chlorate	per lb.	9d.	...
a	,, Crystals	per ton.	£5 to £5 5s.	...
a	Sodium Bichromate, casks ...	per lb.	3½d.	...
	METALS, &c.			
b	Aluminium, Ingots	per ton.	£107 to £112	...
b	,, Wire	per lb.	1/6 to 2/-	...
b	,, Sheet	,,	1/3 to 2/9	...
p	Babbitts Metal and Anti-friction Metal—			
	Grade I	per ton net.	£236	£7 dec.
	Grade II	,, ,,	£162	£2 dec.
	Grade III	,, ,,	£83	£1 dec.
c	Brass (rolled metal 2" to 12" basis)	per lb.	9⅝d.	½d. inc.
c	,, Tubes (solid drawn)	,,	11½d. to 11⅞d.	...
c	,, Wire, basis	,,	9½d.	½d. inc.
c	Copper Tubes (solid drawn) ...	,,	1/0½	½d. inc.
c	,, Bars (best selected) ...	per ton.	£90	£2 inc.
c	,, Sheet	,,	£90	£2 inc.
c	,, Rod	,,	£90	£2 inc.
d	,, (Electrolytic) Bars ...	,,	£66 12s. 6d.	£2/6 inc.
d	,, ,, Sheets ...	,,	£143 10s.	...
d	,, ,, Wire Rods	,,	£76 lvs. 6d.	32/6 i c.
d	,, ,, H.C. Wire	per lb.	9⅝d.	½d. inc.
f	Ebonite Rod	,,	2/3 to 2/6	...
f	,, Sheet	,,	2/3 to 2/6	...
n	German Silver Wire	,,	2/2	...
h	Gutta-percha, fine	,,	6/3	...
h	India rubber, Para fine	,,	1/5	...
l	Iron Pig (Cleveland No. 3.) ...	per ton.	75/-	...
l	,, Wire, galv. No. 8, P.O. qual.	,,	£21	...
g	Lead, English pig	,,	£23 5s.	5/- inc.
g	Mercury	per bot.	£23	...
e	Mica (in original cases) small ...	per lb.	3d. to 3/-	...
e	,, ,, medium	,,	4/- to 8/-	...
e	,, ,, large ...	,,	10/- to 20/- & up	...
p	Phosphor Bronze, plane castings	,,	1/3½	...
p	,, ,, drawn bars & rods	,,	1/3	...
p	,, ,, rolled strip & sheet	,,	1/2½	...
p	,, ,, wire...	,,	1/3½	½d. inc.
o	Platinum	per oz.	£14 10s.	...
d	Silicium Bronze Wire	per lb.	10½d.	...
r	Steel, Magnet, in bars	,,	7½d.	...
n	Tin, Block (English)	per ton.	£265 to £266	15/- to 25/- dec.
n	,, Wire, Nos. 1 to 16	per lb.	4/2	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

In their report dated December 10th, Messrs. James Forster & Co. state that the general lead position is improving, and should this improvement be maintained, they quite expect to see a gradual advance in prices to higher levels.

Lighting and Power Notes.

Accrington.—Reduced Generating Costs.—At a recent meeting of the Town Council, the Mayor, referring to electricity output and fuel costs for October, said these had been reduced to the very low figure of .174d. per kWh generated. If this could be maintained, it would be possible to make modifications in the charges to large power consumers at the end of the financial year.

Australia.—Shoalhaven Scheme.—According to the *Electrical Engineer of Australia and New Zealand*, the committee of experts appointed by the New South Wales Government to investigate the Shoalhaven hydro-electric scheme has decided: (1) That the scheme as set forth in the report of Mr. H. G. Carter, chief electrical engineer of the Public Works Department, is a proper proposal for submission to a Parliamentary standing committee for inquiry and report as part of the policy of the development of the State. (2) That while Mr. Carter dealt with the scheme in three stages—capital, expenditure and output—the idea should be submitted as a whole, that is, on an estimated cost of £2,413,000, with a maximum effective power of 50,000 kW, and that, following on authorisation, the order in which the various sections of the scheme are constructed and the outlay thereon be a matter for consideration from time to time as funds are made available and development proceeds. An important feature of the proposal is the erection of transmission lines to connect with the existing Port Kembla lines on the eastern side, at Nowra and Moss Vale, and with those under construction in connection with the Barren Jack scheme on the western side, at Yass, thus forming a continuous network of lines from the coast as far south as Wagga.

Barking.—Loan.—The Urban District Council is to apply for sanction to the borrowing of £14,080 for the extension of mains to Abbey Road and Upney Road.

Bere Ferrers.—Inauguration of Supply.—An electricity supply for the village was recently formally inaugurated. Practically all the shops and public buildings, as well as the churches, have been connected to the new supply. The undertaking is owned by the Bere Alston and District Electric Light and Power Co.

Bolsover.—Electricity Supply.—In connection with the recent inauguration of the Council's electricity scheme, to which we referred in our last issue, we have received further particulars. Electricity is supplied by the Staveley Coal and Iron Co., Ltd., from its e.h.p. lines at the Council's waterworks. It is conveyed to the waterworks by two routes, one from Worksop and the other from Staveley *via* Markam, thus ensuring a reliable supply should a defect occur on either line or at any of the company's power stations. From the waterworks the supply is conveyed to the Council's substation at 6,600 V, where it is reduced to 250 V for lighting and 440 V for power. The system is 3-phase, 30 cycles. The charge for lighting is a flat rate of 5d. per kWh. An assisted wiring scheme has been introduced by the Council.

Canada.—Hydro-Electric Development.—Owing to the increased demand for electrical power in the city of Winnipeg, the preliminary development of the Slave Falls power site on the Winnipeg River will be commenced by the city authorities during the present winter, a year before it had originally been intended to commence construction. Development should be completed by 1931, and the estimated expenditure is approximately $7,000,000. The site is on the Winnipeg River, 90 miles north-east of the city, and five miles from the Point du Bois plant of the City Hydro. The extent of the growth in electrical power utilisation in Winnipeg and district is further emphasised by recent advices that the fourth unit of the Manitoba Power Company's hydro-electric plant at Great Falls, also on the Winnipeg River, which came into operation recently, was completed barely in time to save the company from the embarrassment of a shortage of power with which to meet its rapidly growing contracts. The normal designed capacity of the units is 28,000 h.p., but the three units, in conjunction with the Winnipeg Electric Company's Pinawa plant production of 30,000 h.p. were feeding a load of 127,000 h.p. as compared with their normal designed capacity of 114,000 h.p. The steel tower h.p. transmission line from Great Falls into Winnipeg, erected during the last few months at a cost of approximately $1,500,000, carries two 110,000-V circuits. To provide still further power for the growing needs of Manitoba, the Manitoba Power Company is already engaged on the installation of another unit at its Great Falls plant.

Calstock (Cornwall).—Electricity Scheme.—The committee appointed by residents in the district to go into the question of a proposed electricity scheme has reported in favour of the Bere Alston and District Electric Light Supply Company's scheme. It is stated that if 1,000 £1 shares in the company are taken up the work of installing electric light in Calstock can commence at once. Two members of the Committee have promised to take up 125 shares between them, and the Committee has decided to canvass the village, together with the company's engineer, in an endeavour to secure the taking up of the remaining shares necessary.

Colne.—Proposed Change-Over.—The Town Council proposes to change the system of electricity supply from d.c. to a.c. in a large portion of the borough. The change will ultimately affect the whole area except the central district.

Continental.—Sweden.—Although only a fraction of Sweden's water power resources are at present exploited, the total capacity of water power plants in Sweden is estimated by the Swedish Water Power Association at 1,456,000 h.p. at the end of 1926. Of this figure 69,000 h.p. has been added since 1925 through the completion of the Government power station of Lilla Edet and a number of private plants and extensions. The largest plant now under construction is that of Hammar-

forsen, which will at first comprise two vertical turbines with a total capacity of 31,000 h.p. The Government is at present installing its seventh 18,000-h.p. turbine in the Porjus plant, and private concerns are constructing hydro-electric stations, aggregating 39,000 h.p.

FRANCE.—WORK has recently been commenced on the establishment of a large hydro-electric station to utilise the water power of the Drac in South-East France. The operations include the construction of a dam about 440 ft. in length to form a large artificial lake.

Douglas (I. of M.).—ELECTRICAL DEVELOPMENT.—Mr. J. H. Robertson has prepared a report on the Corporation electricity undertaking, and reviews the question of an island supply. The Corporation proposes to borrow £83,000 for the purposes of its electricity undertaking, including £40,315 to extend the generating station. The station has a total capacity of 1,230 kW, and an effective capacity of 820 kW, allowing one of the larger sets as a stand-by. It is now proposed to make a further extension by the installation of one steam turbo-alternator of 1,000-kW capacity and to change the system of generation from l.p. d.c. to h.p. 3-phase a.c. Mr. Robertson is of opinion that where the station load calls for generators having a capacity of 1,000 kW or over, steam turbine plant should, under normal conditions, be installed in preference to oil engines. While it would be possible to place two steam turbines on the present site, the space available is too cramped to permit the plant to be laid out for the most efficient working, while the facilities for storing coal and dealing with ashes are quite inadequate. The total cost of a station on a new site at Pulrose, equipped with two 1,000-kW turbo-generators, with building accommodation for a third set, with the necessary boiler plant, switchgear and auxiliaries, including also one cooling tower and pumps, is approximately £57,500. The estimated cost of the extension proposed on the existing site for one turbo-generator of 1,000 kW, with boiler plant, auxiliaries and buildings, is £40,315. Mr. Robertson recommends further investigation regarding the feasibility of a scheme to supply the whole island, and the concentration of electricity generation for all purposes, including traction supplies, in one central station.

Dumfries.—NEW CABLE.—The Town Council has decided to lay a new cable from the hydro-electric power station in Maxwelltown to the Munches Street sub-station, at a cost of £1,500.

Dundee.—CABLES OVER THE TAY.—The general manager and engineer of Dundee Harbour reports that he has received from Mr. A. E. McCall, engineer to the Central Electricity Board, a plan showing the position of the high-pressure cables over the Tay. The clear headroom at the lowest portion of the cables is 150 ft. above high-water level. A proposal, which embodies the construction of three piers in the river, is being considered by a sub-committee of the Harbour Trust.

Dunoon.—ELECTRICITY SUPPLY.—The Town Council is considering an electricity scheme, and has appointed a deputation to interview the M.P. for the division and the Electricity Commissioners, to ascertain the town's position under the Central Electricity Board scheme. On a former occasion, when the Council favoured the introduction of electricity, the ratepayers rejected the scheme. It is probable that electricity will be obtained by a cable across the Firth from Greenock.

Durham.—ELECTRICITY SUPPLY.—The Rural District Council has appointed a sub-committee to discuss the possibility and advisability of inaugurating a scheme of its own for the supply of electricity in the district. Dissatisfaction is expressed with the terms in some instances at which electricity is being supplied at present to the Council houses by the various companies.

Eastbourne.—LOAN SANCTIONED.—The Corporation Electricity Committee has obtained sanction to a loan of £8,150 for mains and plant.

Exeter.—PROPOSED FREQUENCY CHANGE.—The City Council is applying for consent to alter the frequency of its electricity supply from 60 to 50 cycles.

Heswall.—STREET LIGHTING.—Subject to the approval of the Wirral Rural Council, the Parish Council intends to enter into an agreement with the Birkenhead Corporation for the supply, upkeep, &c., of electric standards, at a cost of £5 14s. per lamp.

Horsham.—LOAN.—The Urban District Council has applied for sanction to a loan of £4,500 for the provision and laying of an additional feeder cable to Roffey. The Council has also decided to take preliminary steps for a draft Order to supply electricity in an extended area.

India.—BOMBAY.—The Corporation has asked its Standing Committee to consider and report on the advisability and feasibility of the Council undertaking the work of sole distributors of electricity to the city and, if necessary, to consult the hydro-electric companies as to the terms on which they would agree to supply the electrical energy to the municipality for this purpose.

The Bombay Electric Supply & Tramways Co. has secured a site at Mahim for the erection of a power station.

Liverpool.—POWER STATION EXTENSIONS.—The deputy city electrical engineer (Mr. P. J. Robinson) has submitted a report to the Extensions Sub-Committee on proposed extensions to the Lister Drive power station. He states that the steady increase of load on the system is being maintained, and quite recently the maximum demand reached 78,870 kW. The maximum load to be expected during mid-winter will be in the neighbourhood of 91,000 kW, and it may be anticipated that a maximum load of 100,000 kW will be reached in the year 1928-29. Apart from any question of linking up with other stations in the district under the scheme to be administered by the Central Electricity Board, further plant must be installed to meet anticipated demands. He, therefore, recommends the installation of three pulverised-fuel-fired boilers and one 40,000-kW turbo-alternator with accessories. The Committee has approved the scheme, and has recommended the City Council to apply for sanction to a loan of £455,000, made up as follows: One 40,000-kW turbo-alternator and accessories, £142,000; three boilers with ash-handling plant, £160,000; two cooling towers with pipe work, £60,000; switchgear, transformers and auxiliaries, £14,000; feed pumps, pipes and valves, £4,000; buildings, £45,000; demolition and re-building new baths, £60,000.

LOANS.—Sanction has been received to the borrowing of £50,000 for prospective expenditure on electricity mains, and £55,000 for building extensions at the Lister Drive power station. Application is to be made for sanction to the borrowing of £96,000 for buildings and plant for the completion of the first section of the power station, £300,000 for mains, and £207,450 for the provision of three additional boilers, &c.

London.—BERMONDSEY.—The Borough Council Electricity Committee is to borrow £25,000 for mains, services, meters, &c.

Lowestoft.—SPECIAL ORDER.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising the Corporation to supply electricity in parts of the rural districts of Mutford and Lothingland and Blything.

Manchester.—DOMESTIC APPLIANCES.—The Electricity Committee has tabled a recommendation to the City Council for an extended scheme for the provision of domestic electrical apparatus for hiring purposes. The capital expenditure involved is £100,000.

Mr. H. C. Lamb, general manager and chief engineer, says that the electric-cooker scheme has become so popular that capital outlays are now too heavy to be financed out of profits. Cookers installed in 1924 were 2,771, in 1925 678, in 1926 1,496, and in 1927 3,029, and it is estimated that 4,600 will be installed during 1928.

LOAN SANCTIONED.—The Committee has received sanction to the borrowing of £70,000 for main transmission lines.

PROGRESS DURING OCTOBER.—During the month of October the Corporation electricity undertaking showed an increase in connections of 2,305 kW, bringing the total up to 331,058 kW, and the number of applications received for supply, including consumers for additional supplies, was 1,309, representing a total of 2,759 kW. The number of hired cookers connected increased by 132, bringing the total actually on circuit to 3,809. Applications for the hire of cookers totalled 122. Two new sub-stations were put into commission during the month, and two 3,000-kVA transformers installed at Moss Side sub-station.

Morecambe.—ELECTRICITY DEPARTMENT REORGANISATION.—The Town Council has appointed a sub-committee of the Electricity Committee to go into the whole question of the reorganisation of the Electricity Department and report.

Peterborough.—LOAN SANCTIONED.—The Corporation has received sanction to a loan of £14,045 for coal handling plant.

Plymouth.—ELECTRICITY IN BULK.—The Corporation Electricity Committee has received sanction to the establishment of main transmission lines in duplicate for the purpose of supplying electricity in bulk to the Plympton St. Mary Rural District Council.

The Corporation has asked the electrical engineer to report with regard to the development of the use of water power for the purpose of the electricity undertaking.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

EASTBOURNE.—Flat rate: A reduction of ¼d. per kWh. Maximum demand system: The initial charge from 7½d. to 6d. per kWh. All-in tariff: The "follow-on" rate from 1d. to ¾d. per kWh. Special rate consumers: A reduction of ¼d. per kWh.

DUDLEY.—*Shropshire, Worcestershire and Staffordshire Electric Power Co.*—Lighting: From 52 per cent. to 40 per cent. above the basic rate. Power: First 600 kWh per quarter, from 60 to 50 per cent. above the basic rate; over 600 kWh per quarter, from 52 to 40 per cent.

Sheffield.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to extend electricity mains at a cost of £19,000.

STREET LIGHTING.—The Committee has decided to arrange for the public lighting of Prince of Wales Road, by means of underground mains, at an estimated cost of £1,683.

Skegness.—ELECTRICITY SUPPLY.—At the last meeting of the Town Council, the Clerk was instructed to communicate with the Lincolnshire Power Co., Ltd., to ascertain upon what terms electricity could be supplied to the district.

Stretford.—LOANS SANCTIONED.—The Urban District Council Electricity Committee has obtained sanction to loans of £20,000 for electricity mains and services, and £8,500 for a main transmission line from Barton.

Swindon.—ELECTRICAL PROGRESS.—At a recent Government inquiry into an application to extend the borough of Swindon, it was stated, in relation to the Corporation electricity works, that in 1906 there were 457 consumers, the electricity sold totalled 698,000 kWh, and the revenue reached £7,900. For the year ended March 31st last the sales of electricity amounted to 7,215,000 kWh, and the revenue was £65,000. The Corporation had entered into an agreement with the G.W.R. by which the company was to take a large supply.

Torquay.—LOAN SANCTIONED.—The Corporation Electricity Committee has obtained sanction to a loan of £1,700 for piling for building foundations at the Newton Abbot power station in anticipation of a future extension of the boiler-house buildings.

Wallasey.—LOAN.—The Corporation is to apply for sanction to the borrowing of £38,000 towards a £150,000 extension scheme at the electricity works.

Wimbledon.—LOAN SANCTIONED.—The Borough Council has received sanction to a loan of £2,367 for generating plant.

Worksop.—LOSS ON ELECTRICAL APPLIANCES.—A sub-committee appointed by the Urban District Council to go into the question of the purchase, hire and sale of electrical appliances has reported that the number of appliances let out on hire was 1,466, the actual cost being £7,634. The annual loss to the department was over £1,000. The sub-committee has prepared a revised scale of hiring charges, to come into force at the end of the present quarter, and also recommended the introduction of a deferred system of purchase of appliances. The Council has adopted the recommendations.

Tramway and Railway Notes.

Blackpool.—NEW TRAMCAR DESIGN.—A new tramcar of the Promenade double-staircase type has been provided at Blackpool. Instead of the usual polished woodwork, inside, the seats are fully sprung and upholstered in red cloth. Eight cars of the double-staircase type are to be re-seated in this way.

Brazil.—RAILWAY ELECTRIFICATION.—Considerable progress has been made on the electrification of the Minas Geräes railway. The section being electrified (73 kilometres long) is between Barra-Mansa and Augusto-Pestana. Owing to the large amount of steam coal necessary to provide power for crossing the Serra de Mantiqueira, the steepness of the incline permitting only a few cars to be drawn by a single locomotive, considerable economies in working are expected to follow the adoption of electric traction. Five electric locomotives will be used, power being obtained from the Piloes Falls on the Bananal River, which will supply 2,400 h.p. of three-phase current at 33,000 V.—*Reuter's Trade Service* (Minas Geräes).

Burnley.—NEW CARS.—The Town Council is recommended to purchase five new double-deck tramcars, at an estimated cost of £9,800.

Continental.—AUSTRIA.—The presidents of the leading industrial companies have addressed a memorial on behalf of Austrian industry to Dr. Michael Hanisch, President of the Republic, urging that no decision should be taken in the question of the electrification of the Austrian State Railways until the estimates and plans have been thoroughly examined by a committee of impartial experts, preferably foreign. The President has promised that this memorial will be referred to the competent authorities with a view to giving effect to the recommendations of the petitioners. It is understood that the petitioners have in mind an English expert, Mr. Davidson, and a German expert, Herr Wechberg.—*Reuter* (Vienna).

FRANCE.—A proposal to abolish the tramways from the centre of Paris, owing to traffic congestion, was agreed to by the authorities on December 9th, says the *Daily Mail*, and negotiations with the company have been started.

On December 12th a first-class coach in the tunnel beneath the Seine of the Paris underground railway turned over on to the opposite track. A train coming from the opposite direction was stopped in time to avert a collision. A number of passengers were injured.

BELGIUM.—The Société National des Chemins de Fer Vicinaux, of Brussels, is making steady progress with the electrification of its local railways. The electric service which has already been running for some time between Charleroi and Cazier has now been extended to Bruyeres. Electric trains are also running over an extra two miles of the Louvain-Tervueren line. The work of electrifying a further section of the Charleroi-Montigny-le-Tilleul line is about to be put in hand.

HOLLAND.—The electric tramway system of the Société Hollandaise de Tramways de Rotterdam has been purchased and taken over by the Rotterdam municipal authorities.

Leeds.—LOAN.—The Corporation is seeking sanction to a loan of £18,650 for a rotary convertor and equipment, switchgear and feeder cables for the Tramways Department.

London.—EXPERIMENTAL BOGIE CARS.—The Highways Committee of the L.C.C. has recommended the expenditure of £6,500 for the provision of two experimental bogie cars for use on hilly routes.

TRAFFIC DELAY.—Owing to the failure of the electric signalling apparatus at Cannon Street station of the Southern Railway at 6 a.m. on December 12th, the train service between London Bridge and Cannon Street was suspended. The defect was rectified by 8 a.m., and a normal service was resumed.

Manchester.—DOUBLING OF TRAMWAY TRACK.—The Ministry of Transport has sanctioned the proposal of the Corporation Tramways Committee to double the tramway in Withington Road.

Rotherham.—LOAN.—The Town Council has applied to the Ministry of Transport for sanction to a loan of £14 000 for railless cars and overhead equipment for the proposed new joint service with the Mexborough and Swinton Tramways Co. between Rotherham and Mexborough.

South Africa.—CAPE TOWN.—The electrification of the Cape Town to Simons Town railway is progressing satisfactorily. Between Salt River and Simons Town the mast foundations are completed, and between Salt River and Cape Town the concrete supports are being erected. The Sale River power station, it is expected, will be ready in March, and the cables are being laid between Salt River and Kenilworth. The six sub-stations are either completely built or nearly so, and some of them are being equipped with plant.

Telegraph and Telephone Notes.

Grimsby Radio Station.—LOCATION CHANGED.—The G.P.O wireless-telegraph station at Grimsby that is known as "Humber Radio," which communicates with ships at sea, was transferred to Mablethorpe (Lincs.) on December 6th. Its name will remain unaltered, and it will afford a continuous day and night service.

Irish Free State.—AUTOMATIC TELEPHONY.—A further extension of the automatic telephone system in Dublin has taken place. The new area served is the south-east portion, taking in the townships of Pembroke and Rathmines, and the extension serves about 1,100 subscribers; it was opened on December 11th.

Norway. — BRITISH - NORWEGIAN TELEGRAPH COMMUNICATION.—In an endeavour to improve telegraph communication between Norway and London, the Norwegian Government has decided to exchange with Great Britain two telegraph officials for a month, with a view to the mutual study of conditions in the two countries.—*Reuter* (Oslo).

Pacific Cable Board.—ANNUAL REPORT.—The results of the year's operations to March 31st, 1927, indicate that the receipts (£478,302) exceeded the ordinary working expenses by £178,284; after taking account of the annuity of £77,544 payable to the National Debt Commissioners in respect of interest and repayment of capital, a surplus of £100,739 has been devoted to the reserve and renewal fund in compliance with the provisions of the Pacific Cable Act, 1927. The traffic receipts (£467,063) exceeded those of the previous year by £13,467, due in part to the greater volume of traffic, but mainly accounted for by the circumstances that, owing to a carry over from the previous year, payments received during the year under review from one of the connecting administrations in adjustment of traffic exchanges covered 13 months. The expenditure (excluding the contribution to the reserve and renewal fund) was higher by £21,030 than that of the preceding year. The total assets of the reserve and renewal fund amounted to £356,119, and the expenditure from the fund during the year in connection with the duplication of the cables between Vancouver Island and Fiji amounted to £2,131,308. The cable between Norfolk Island and Auckland was interrupted from March 1st to 13th, 1927, but did not involve any inconvenience to traffic. The duplication of the Board's cable system was completed during November, 1926. More than 12,000,000 words of international traffic (*i.e.*, other than local messages between Australia, New Zealand, and the Pacific Islands) were transmitted across the Board's system, approximately 120,000 words above the total of the previous year, and established a further record. Ordinary, or full rate, international traffic fell off approximately 100,000 words, the loss being attributed to the attraction of the cheaper services. Week-end telegrams were less by approxi-

mately 130,000 words, the decrease being due to the re-introduction by the rival route of this service, which had for many years past been available only by the Board's route. There was an increase of approximately 40,000 words in Government traffic, 230,000 words in deferred ordinary, 60,000 words in Press, and 50,000 words in deferred Press, while the daily letter telegrams showed a reduction of approximately 40,000 words. In addition, approximately 3,700,000 paying words were carried between Australia and New Zealand and between those Dominions and the Pacific Islands, approximately 250,000 words in excess of the number handled during the previous year. On February 1st the Board reduced its tariffs for telegrams exchanged between the British Isles and Australia and New Zealand, and corresponding reductions were made for traffic between Canada and Australia or New Zealand, as a corollary to the duplication of the system. The reductions were estimated to represent a sacrifice of approximately £27,600 per annum on the volume of traffic which was being handled at the time they were brought into force.

The Telephone Service.—NEW EXCHANGES.—A new exchange was opened on December 7th at Hatch End, Middlesex, to serve an area of about four square miles in the neighbourhood of Hatch End, Carpender's Park, Royston Park, and Pinner Wood. Its present capacity is 400 lines, but the switchboard can be extended to accommodate 2,700 lines.

Lying on the line of total eclipse of the sun on June 29th, Southport was illuminated for the occasion, and scarcely six months later the town witnessed another eclipse, that of its manual telephone system by "Strowger" automatic plant. The area has a multi-office network, comprising Southport main and three satellite exchanges, one of which (Ainsdale) has yet to be installed; the other satellites at Birkdale and Churchtown, respectively, serve the residential districts after which they are named, and the Southport main automatic exchange is at present equipped for upwards of 3,700 lines, of which 390 are p.b.x. lines and 100 serve coin-box stations. The system is a combination of four and five digits, and employs booster-battery metering; 10 exchanges will dial in to Southport subscribers, whilst outgoing traffic will continue to be handled manually for these exchanges. The operators in local area sub-exchanges still working manually will also have facilities for dialling in to Southport automatic subscribers, whilst the manual operators still retained at Southport will extend calls incoming from outlying exchanges and terminating on the Southport manual switchboard. In one respect the main exchange resembles that at Holborn, London, for it is equipped with three semi-"B" key-sending positions for handling manual traffic incoming from Manchester and Liverpool to the automatic exchanges. As an essential link between the "old" and the "new" systems, a new 19-position manual switchboard includes the three semi-"B" positions, with a capacity for 40 incoming key-ended order-wire junctions; two jack-ended junction positions; and fourteen "A" operators' positions; supplementary equipment includes a 4-position test desk, a supervisor's desk, and a 6-position monitor's desk. The Alton 25-cell duplicate main batteries have each a present capacity of 1,310 Ah with charging motor-generators in duplicate and two ringing dynamotors. The supervisory equipment gives alarm signals, not only when abnormal conditions arise within the main exchange itself, but also in the event of similar occurrences at the distant satellite exchanges, which are unattended, except for battery charging and routine testing purposes. The two satellite exchanges resemble one another; Birkdale is at present equipped for 1,600 lines and has ultimate capacity for 2,500; Churchtown caters for 1,000 lines, with provision for twice that number. The whole of the exchange equipment has been manufactured and installed to the order of the British Post Office by the Automatic Telephone Manufacturing Co., Ltd., and was successfully cut into service on December 3rd. Boasting the highest telephone density in Great Britain (9.8 telephones per 100 population), Southport has upwards of 6,000 subscribers in the area already.

NEW LONDON "TOLL" EXCHANGE.—Owing to the growth of traffic in the London toll area, a new toll exchange has been opened at the G.P.O. (South). The old exchange has been retained, and will deal with incoming traffic from the toll area of London, while the new exchange will deal with all traffic outgoing from London.

GROWTH OF SYSTEM.—The total number of telephone stations in the Post Office system on September 30th was 1,566,960. New stations added during September numbered 17,713, and the cessations 8,142, being a net increase of 9,571 stations The number of inland trunk calls dealt with during August was 8,518,656, an increase of 1,023,560, or 13.7 per cent., compared with August of last year. Calls made to the Continent during August numbered 24,503, and from the Continent 26,574, representing increases of 16.5 and 12.8 per cent. respectively, over August, 1926.

Transatlantic Telegraphy.—NEW CABLE.—The laying of the first section of the new Franco-American submarine telegraph cable, which is to cost fr. 100,000,000 (about £800,000) was commenced at Le Havre, France, on December 8th, says the *Financial News*. The first section will terminate at Newfoundland, whence a second section will follow on to New York. The French shore end was sunk by the cable-layer *Druge*, but the *Colonia* will lay the deep-sea sections.

Radio Notes.

Empire Broadcasting.—DAILY TRANSMISSION.—The Chelmsford Empire transmitter (5SW) commenced on December 12th to transmit daily from 12.30 to 1.30 p.m. and from 7.0 p.m. until midnight, except on Saturdays and Sundays, on a wave-length of 24 metres. The National Broadcasting Co. of America, as well as organisations in the Dominions, will possibly relay some of the transmissions, which may last for some months. Chelmsford will relay the programmes of Daventry (5XX).

France.—GOVERNMENT REORGANISATION.—M. Bokanowski, Minister of Commerce, has laid demands for credit for development before the Finance Committee of the Chamber. The Minister proposes to create three "national," or main, and 18 "district," or subsidiary, broadcasting stations. One of the national stations is to be at the existing school of telegraphy and telephony, whose transmitter will be developed accordingly. The other two national stations and the district stations are to be built with Government assistance and worked by private syndicates. The whole scheme is intended to be in working order within two or three years. The necessary funds will be obtained by raising the present tax of 1 fr. on each receiving set, which is not levied effectively, and of which many listeners are not even aware, to 10 fr. and by stiffening up the machinery for collection, says *The Times*. The Finance Committee has expressed the view that the national stations should be set up as soon as possible, and should be used to broadcast not only entertainment, but information useful to the rural population and weather reports. It is probable that existing private stations will eventually be acquired by the State.

Irish Free State.—IMPORT TAX.—When members of the wireless trade dined together in Dublin recently, the speakers urged the removal of the duty on imported components and materials of the trade, the contention being that, as there was no industry to protect at home, the imposition of the tax was for revenue purposes only.

Regional Broadcasting.—NEW STATION SITES SOUGHT.—It became known last week that a mobile transmitter with two masts and an aerial was touring the country in search of suitable sites for stations to be erected under the regional scheme under which the present 2LO station will be moved to a site north of London. The B.B.C.'s regional stations will serve: London and the South-East; the North of England; Scotland; Western England and Wales; and Northern Ireland. The mobile transmitter, it is understood, has already carried out tests in the Pennines and country just north of London, while engineers have made a rough survey of Wales.

South Africa.—LICENCES INCREASING.—When the African Broadcasting Co. took over the services there were 11,000 licensed listeners. To-day the total is more than 14,000; "piracy," however, continues, and another attempt is shortly to be made to deal with it. Now that the African Co. is broadcasting throughout the whole of the Union, developments may be expected, says *World-Radio;* a new station is to be erected in Johannesburg, and it will contain a 20-kW set, against the ½-kW set now doing duty, and should be in operation about March 6th, 1928.

United States.—SHORT-WAVE TESTS.—In its pursuit of knowledge of short waves, the General Electric Co. of America has developed a 5-metre transmitter wherewith propagation tests will be conducted. Apparently the signal follows a straight unobstructed line: a receiver on a hill will pick up a strong signal, but the same receiver, when placed on the other side of the hill, so that it is not within the "line of vision" from the transmitter, will get a barely audible signal. Natural static was absent from the tests made, but man-made static, such as that from the ignition systems of automobiles, was very noticeable; thus far the transmitter has been tested only thirty miles away. Extremely high frequencies are involved, a five-metre wave representing approximately 60,000,000 cycles per second, and the 1-kilowatt transmitter is constructed so that it can be elevated and swung from one of the 300-ft. masts at the transmitter laboratory at South Schenectady. Two new-type, four-element, air-cooled valves are used in the special oscillator circuit; the antenna is about 8 ft. long, and consists of a half-wave radiator, voltage fed, connected directly to the oscillator. A meter in the middle of the antenna is used for measuring the antenna current, which is read by means of a surveyor's transit on the ground. Tuning the transmitter is made possible by a rope drive connected with a "vernier" control; wires for supplying power and control are run to the transmitter from the ground. The portable five-metre receiver used consists of a regenerative detector and one audio amplifier; the grid tuning coil consists of five turns of wire 0.5 in. in diameter; the "tickler" coil is 0.25 in. long and 0.25 in. in diameter, and it is inside of the grid coil. Very small condensers located close together are used for tuning and regeneration control, and special low-capacity valves are used. Generally, it is unnecessary to use any antenna, the 'phone cords picking up sufficient energy; an antenna may, however, be used.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Argentina.—BUENOS AIRES.—January 17th. National Sanitation Works Department. Three 350-kW Pelton-type turbines and 6,600-V, three-phase generators. Two 20-kVA, 3-phase static transformers, one distribution switchboard and connections. (B.X. 3921.)*

Ammanford.—AMALGAMATED ANTHRACITE COLLIERIES, LTD.—Electrical goods for six months for a group of 20 collieries. Particulars from the company's Stores Department, Central Colliery, Ammanford.

Australia. — MELBOURNE. — January 3rd. Postmaster-General's Department. Switchboard lamps, lamp caps, and lamp sockets. (B.X. 3943.)*

January 23rd. State Electricity Commission of Victoria. 6,600-V automatic induction voltage regulators. (B.X. 3972.)*

January 31st. Sub-station protectors, mountings, fuses and heat coils for telephone exchanges. (B.X. 4019.)*

SYDNEY.—February 1st. New South Wales Government Railways. One 3,000-kW rotary-convertor unit for Hornsby sub-station, one ditto for St. Leonards sub-station. Chief Electrical Engineer, 61, Hunter Street, Sydney.

January 9th. Municipal Council. 11,000-V metal-clad switchgear for sub-stations. Construction Engineer, Electricity Department, Town Hall, Sydney.

Birmingham.—January 9th. Tramways and Omnibus Committee. Supply and delivery of 50 new tramcar bodies. Form of tender from Mr. A. Baker, general manager, Tramway Offices, Council House, Congreve Street.

January 10th. Electric Supply Department. Three 2,000-kW rotary-convertor equipments; two 1,000-kW ditto, and two 750-kW ditto. (See this issue.)

Chile.—SANTIAGO.—March 7th. Ports Commission. Five electric travelling portal cranes for Punta Arenas. (A.X. 5648.)*

Edinburgh.—December 19th, District Board of Control. Electrical work for two residential blocks at Gogarburn. Schedules, &c., from Mr. S. Kaye, 14, Hill Street, Edinburgh.

Forfarshire.—December 29th. Education Authority. Electric lighting installation for the Brechin High School, additions, &c. Schedules from Mr. J. Eadie, clerk and treasurer, Education Offices, Forfar.

Leicester.—January 21st. Electricity Department. Buildings, coal- and ash-handling plant, railway sidings, &c., three water-tube boilers complete, one 25,000-kW and one 1,500-kW turbo-alternators with condensing plant and accessories, and three ferro-concrete cooling towers. (December 2nd.)

London.—BETHNAL GREEN.—December 29th. Board of Guardians. Electric passenger lift, &c., at the Institution, Waterloo House, Bethnal Green, E. (December 2nd.)

ISLINGTON.—January 20th. Electricity Department. 12 months' supply of cables, meters, transformers, lamps, wires, &c. (See this issue.)

Lourenco Marques.—February 13th. Ports and Railways. Two 350-h.p. electric motors. (B.X. 3996.)*

Manchester.—December 23rd. Electricity Committee. Electric wash boilers. (December 9th.)

January 3rd. Low-pressure auxiliary pipework. (December 9th.)

New Zealand.—WELLINGTON.—January 10th, 1928. Public Works Department. Additional 110,000-V switchgear, steelwork and control board for Arapuni electric power supply. (B.X. 3837.)*

January 17th. 110,000-V switchgear protective apparatus, steelwork, storage batteries, &c., for the Waikaremoana power scheme. (B.X. 3858.)* 50,000-V switchgear and steel work for Arapuni. (B.X. 3917.)* 11,000-V switchgear and metering equipment for Arapuni (Sec. 254). (B.X. 3920.)*

January 24th. 11,000-V switchgear and metering equipment for Arapuni (Sec. 261). (B.X. 3918.)*

February 18th. Storage battery and motor for Arapuni. (B.X. 4032.)*

April 21st. New Zealand Government Railways. Machine tools and workshop equipment. (A.X. 5647.)*

CHRISTCHURCH.—March 13th. Drainage Board. Nine electric centrifugal sewage pumping plants. (A.X. 5457.)*

South Africa.—JOHANNESBURG.—January 3rd. Municipal Council. 32 transformers. (B.X. 3991.)* Electric lamps and holders. (B.X. 4042.)*

December 29th. S.A. Railways and Harbours. One 5-ton 3-motor electric overhead travelling crane for East London workshops. (A.X. 5506.)*

Stafford.—December 31st. Education Committee. Installation of electric lighting and power in the Friary School, Lichfield. (December 9th.)

Swindon.—January 14th. Electricity Department. 6,600-V and 3,300-V a.c. and 440-V d.c. switchgear. (See this issue.)

Uruguay.—MONTEVIDEO.—January 21st. State Electricity Works. Overhead sub-stations and switching towers. (B.X. 4028.)*

February 5th. Ministry of Public Works. 22 cranes for the Hydrographic Department. (A.X. 5478.)*

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Argentine.—The contract for the construction and equipment of electric power and lighting plant for the city of Rafaela, Province of Santa Fé, has been awarded to Buxton, Guilayn & Co., Ltd., of Buenos Aires. The machinery will be British-built throughout, the Diesel engines being supplied by Mirrlees, Bickerton & Day, Ltd., and the electrical machinery by the Metropolitan-Vickers Electrical Co., Ltd. The system will be three-phase, 50 cycles, 3,300 volts, distributed at 380 and 220 volts.

Australia.—SYDNEY.—Electricity Supply Committee. Recommended:—

H.p. and l.p. underground cable (£20,672).—Enfield Cable Works (Aust.), Ltd.

3 d.c. switchboards (£1,832).—Metropolitan-Vickers Electrical Co., Ltd.

Rubber insulated cable (£4,581).—Australian General Electric Co., Ltd.

MELBOURNE.—Commonwealth P.M.G.'s Department.

Automatic telephone switching equipment.—(£134,892), Automatic Telephones, Ltd.; (£2,710), British General Electric Co., Ltd.; (£1,350), Standard Telephones and Cables (Aust.), Ltd.

Switchboard cable.—(£5,152), Enfield Cable Works, Ltd.; (£1,338), Siemens (Aust.) Pty., Ltd.; (£976), Connolly's (London).

Telephones (£6,890).—Sterling Telephone & Electric Co., Ltd.

Motor-generator (£1,227).—Crompton & Co., Ltd.

P.i.l.c. cable.—(£9 483), Enfield Cable Works, Ltd.; (£7,461), Pirelli-General Cable Works, Ltd.

Accumulator batteries and plates.—(£3,270), T. K. Steanes and Son; (£4,063), E. H. Sharpe; (£2,368), Automatic Telephones, Ltd.

—*Tenders.*

Birkenhead.—Electricity Committee. Accepted:—

Cable.—(£2,927 13s.), Hackbridge Cable Co., Ltd.; (£1,535), Macintosh Cable Co., Ltd.

Two sets indoor type earthing resistances (£236).—Metropolitan-Vickers Electrical Co., Ltd.

Burton-on-Trent.—Electricity Committee. Accepted:—

Mains extension for supply to Branston artificial silk factory (£4,121).—Johnson & Phillips, Ltd.

Switchgear (£1,076).—Metropolitan-Vickers Electrical Co., Ltd.

Two boilers for electricity works (£38,398).—Babcock and Wilcox, Ltd.

Coventry.—Corporation. Accepted:—

H.p. switchgear (£896), four additional feeder panels (£1,727).—Metropolitan-Vickers Electrical Co., Ltd.

Dewsbury.—Town Council. Accepted:—

Cables (£547).—Power & Lighting, Ltd.

Doncaster.—Electricity Committee.

L.p. cables (£824).—Hogan & Wardrop (Netherland Cable Works, Delft, Holland). The lowest English tender was £927. The Council has adopted the recommendation.

Farnworth.—We are informed that the U.D.C. has placed a small cable order with a French firm, the Forges et Ateliers de Constructions Electriques de Jeumont, at over 32 per cent. below the average quoted price by C.M.A. firms.

Glasgow.—Cleansing Committee. Recommended:—

Outside electric lighting at Govan destructor works (£493).—Kennedy, Stark & Co.

Housing Committee. Recommended:—

Electrical installation 96 houses Parkhead rehousing scheme (£476).—James Laird & Co.

Grimsby.—Electricity Committee. Recommended:—
E.h.p. switchgear for waterworks pumping station (£327).—Metropolitan-Vickers Electrical Co., Ltd.
Switchgear in connection with supplies to Bradley Cross Roads (£186).—Ferguson, Pailin, Ltd.

Hornsey.—Electricity Committee. Recommended:—
Twelve disconnecting boxes (£276).—Motor Gear & Engineering Co., Ltd.

Leeds.—Tramways Committee. Accepted:—
Six feeder pillars (£165).—Yorkshire Switchgear & Engineering Co., Ltd.
One car set traction motors (£380).—Metropolitan-Vickers Electrical Co., Ltd.

Electricity Committee. Accepted:—
Sub-station switchgear (£1,182).—Ferguson, Pailin, Ltd.; (£962), English Electric Co., Ltd.
Cables.—(£1,230), Enfield Cable Works, Ltd.; (£2,255), Hackbridge Cable Co., Ltd.; (£2,359), Macintosh Cable Co., Ltd.; and (£1,548), Greenwich Cable Works, Ltd.

Liverpool.—Electricity Committee. Recommended:—
Three boilers complete with economisers, air heaters, mechanical draught fans and motors, chimneys, grit collectors, pulverised fuel equipment and burners (£157,450).—Babcock & Wilcox, Ltd.

Manchester.—Tramways Committee. Accepted:—
Trolley wire.—British Insulated Cables, Ltd.
Electric lighting installation at Birchfields car sheds.—Maitland & Co. (Manchester), Ltd.
Armatures for tramcar motors.—British Thomson-Houston Co., Ltd.
Steel tramway poles.—British Mannesmann Tube Co., Ltd.

Oldham.—Electricity Committee. Accepted:—
Cable.—Union Cable Co., Ltd.
Motor starters.—British Thomson-Houston Co., Ltd., and Airedale Manufacturing Co., Ltd.

Rochford.—Board of Guardians. Accepted:—
Additional storage batteries (£815).—Tudor Accumulator Co., Ltd.

Rotherham.—Town Council.
At last week's meeting of the Council, the Electricity Committee's recommendation to purchase cable of Dutch manufacture at a cost of £4,637 was approved.

Electricity Committee. Recommended:—
Switches and instruments in connection with the linking-up with Sheffield (£1,900).—British Thomson-Houston Co., Ltd.
Cable for Maltby railless route (£1,595).—Callender's Cable and Construction Co., Ltd.

Salford.—City Council. The City Council at its meeting last week considered the recommendation of the Electricity Committee to accept the tender of N. V. Nederlandsche Kabelfabriek, of Delft, at £1,700, for the supply of cable to British Standard Specification. Alderman Billington, the chairman of the Electricity Committee, reminded the Council that its policy in the matter of such a contract had been already decided. At the time of the decision the difference in price was 48 per cent. as between British and foreign tenders. It had since diminished till it was 14.8 per cent. The foreigner had raised his price. An amendment to refer the recommendation back was supported by six members only, and was lost. The original resolution was then passed.

Scotland.—CENTRAL ELECTRICITY BOARD.—The contract for 250 miles of overhead transmission lines for the Central Scotland electricity scheme has been placed with British Insulated Cables, Ltd., at approximately £400,000. The work is to be commenced in the New Year, and will probably be completed during 1930. It is stated that all-British material is to be used, and that 1,500 steel lattice towers, each between 70 ft. and 80 ft. in height, will be erected. The steel for the towers will be made in the Glasgow district, and the insulators will be manufactured in the Potteries; 1,000 miles of Lancashire-made aluminium-covered steel conductors, 29 route miles of double-circuit lines, and 199 miles of single-circuit lines will be used. The working pressure will be 132,000 volts.

Sheffield.—Tramways Committee. Accepted:—
Air compressor with electric motor, &c. (£489).—Alley and MacLellan, Ltd.

Stockton-on-Tees.—Electricity Committee. Accepted:—
L.p. paper insulated cables.—Hackbridge Cable Co., Ltd.
A.c. house service meters.—Metropolitan-Vickers Electrical Co., Ltd., and Ferranti, Ltd.
House service cut-outs.—W. T. Henley's Telegraph Works Co., Ltd.

Stretford.—Electricity Committee. Accepted:—
Coal-handling plant (£452).—Bannister, Walton & Co., Ltd.

Tunbridge Wells.—Town Council. Accepted:—
H.p. motor-driven feed pump (£171).—Rees Roturbo Mfg. Co., Ltd.
Transformers (£315).—British Electric Transformer Co., Ltd.

Wimbledon.—Electricity Committee. Recommended:—
Water heater for turbo-alternator (£114).—Metropolitan-Vickers Electrical Co., Ltd.

Forthcoming Events.

Birmingham Electric Club.—Friday, December 16th. Grand Hotel. Annual general meeting.

Institution of Production Engineers.—Friday, December 16th. 83, Pall Mall, S.W. 7.30 p.m. "Chromium Plating and Modern Plating Practice." Mr. E. J. Dobbs.

Junior Institution of Engineers.—Friday, December 16th. 39, Victoria Street, S.W. 7.30 p.m. "Hardening and Quenching Throughout the Ages." Mr. P. J. Haler.

British Electrical Development Association.—Friday, December 16th. Royal Society of Arts. 7.30 p.m. "Electrical Progress in Cinematograph Pictures."

Institution of Electrical Engineers (London Students' Section).—Friday, December 16th. Institution, London, W.C. 7 p.m. "Automatic Voltage Regulators." Mr. E. B. Watton.

Association of Mining Electrical Engineers (London Branch).—Tuesday, December 20th. Junior Institution of Engineers, 39, Victoria Street, S.W. 6.30 p.m. "The High Voltage Sub-station." Mr. C. E. Atkinson.

Paisley Association of Electrical Engineers.—Tuesday, December 20th. George A. Clark Town Hall, Paisley. 7.30 p.m. "Roads and Motor Cars." Mr. P. A. Mossay.

Notes.

The Electrical Engineers' Ball, 1928.

It has been arranged to hold this very popular event—the nineteenth—on February 10th next, at the Hotel Cecil. We print as usual a list of the General and Executive Committees:—

General Committee.

Alabaster, H.
Alabaster, G. H.
Andrews, Leonard.
Atkinson, Ll. B.
Baldwin, O. H.
Balfour, George, M.P.
Bowden, J. H.
Callender, Sir T. O., J.P.
Chattock, R. A.
Cramb, A. C.
Cridge, A. J.
Couzens, H. W.
Elder, T. C.
Ferranti, Dr. S. Z. de.
Fox, E. J.
Gatehouse, E. A.
Gill, Frank.
Gillespie, M. M.
Gray, James.
Gregory, J. P.
Gridley, Sir Arnold, K.B.E.
Hadley, A. E., C.B.E.
Highfield, J. S.
Hill, C. W.
Hirst, Sir Hugo, Bt.
Hunter, P. V., C.B.E.
Hughman, R. W.
Kerr, M. J. D.
Kingsbury, J. E.
Knight, C. M.
Lackie, W. W., C.B.E.
Leaf, H. M.
Leigh, Lt.-Col. F. A. Cortez.
Lonsdale, W. Stanley.
Macgregor, J. J., C.B.E.
McKinstry, A. E.
McKay, H. J. S.
McLelland, Wm. C. B.
McMahon, P. V.
Mason, A. V.
Matthews, W. Lee.
Midgley, H. E.
Mordey, W. M.
Moss, E. W.
Murray, Lee.
Nalder, F. H.
Nash, Sir Ph., K.C.M.G., C.B
New, E. S.
Noble, Sir Wm.
Page, A.
Partridge, G. W.
Pearce, Dr. S. L., C.B.E.
Pooley, F.
Purves, Col. T. F.
Railing, M. J.
Riley, G. E.
Rinder, A. S.
Rogers, F. M.
Rowell, P. F.
Russell, Dr. Alexander.
Sayer, C. E.
Scholey, H., C.B.E.
Shaughnessy, E. H.
Siddeley, H. C.
Sillar, A. M.
Snell, Sir John, G.B.E.
Sutton, Sir George, Bt.
Taite, C. D.
Taylor, G. M. C.
Trezise, J. M. G.
Walton, A. H.
Wilson, David.
Woodhouse, W. B.
Worsdell, F. E.

Executive Committee.—O. H. Baldwin, H. W. Couzens, A. C. Cramb, C. W. Hill, J. E. Kingsbury, W. S. Lonsdale, P. V. McMahon, A. M. Sillar, A. H. Walton.

Hon. Secretaries.—A. M. Sillar, C. W. Hill.

Hon. Treasurer.—J. E. Kingsbury.

The Manchester Electrical Engineers' Ball.

The annual dance in Manchester was held at the Midland Hotel on Friday evening, December 9th, some 240 guests being present. Some excellent exhibition dancing, an exceedingly good band, and some wonderful head-dresses for the visitors all contributed to a most enjoyable evening. Mr. C. D. Taite (who made a splendid Master of Ceremonies, in addition to his secretarial duties), Mr. P. Harcourt-Williams, and their colleagues may congratulate themselves on what was, by general consent, perhaps the best of the Manchester series.

The Midland Electrical Engineers' Ball.

The annual dance recently held in Birmingham, at the Grand Hotel, proved, as usual, to be a most enjoyable and well-attended function. The arrangements made by Mr. W. Y. Anderson and his colleagues of the Executive Committee for the comfort of the guests were quite perfect, as is always the case, and they are to be congratulated on a thoroughly successful evening.

A Census of Thunderstorms.

Last winter several appeals were made for records of thunder and lightning occurring during the six months from October, 1926, to March, 1927. A large number of observers supplied information, says the *Daily Mail*, which indicates that thunderstorms took place somewhere in the British Isles on 96 days out of 182 in the six months. The monthly figures are recorded in the following table:—

1926.	England.	Wales.	Scotland.	Ireland.	British Isles.
October	16	11	10	9	21
November ...	18	11	10	12	20
December ...	5	1	4	0	8
1927.					
January ...	14	8	16	14	23
February ...	6	1	3	2	7
March	14	5	3	7	17
Total (6 months)	73	37	46	44	96

The stormiest districts of the British Isles were the central portions of the west coasts of Scotland and Ireland; other very disturbed areas included the English Lake District, the Severn Valley, south-west Yorkshire, and parts of Sussex and Surrey. There were no storms in many parts of the east Midland and northern counties of England. This investigation is being continued during the present winter, and additional information is invited. Fuller particulars of the storm census will be sent to intending observers on request by Mr. S. Morris Bower, F.R.Met.Soc., Langley Terrace, Oakes, Huddersfield.

Overhead-Line Regulations.

We have received a copy of a letter to the following effect, which has been widely circulated by the Overhead Lines Association:—

Will every engineer who has experience of overhead-line design, construction, and operation, write immediately (preferably in duplicate, so as to render one copy available for the authorities) to Mr. Theodore Stevens, hon. secretary of the Overhead Lines Association, 50, Lincoln's Inn Fields, London, W.C.2, stating very briefly his overhead line experience and suggestions as to the modifications he would recommend to "facilitate" and "regulate" the more general supply of electricity in this country for HIGH and for LOW PRESSURES?

It will be preferable if the matter is presented in the following order:—

(1) Recommended minimum height of lines above the ground.

(2) The essentials for guarding lines (other than to comply with Post Office Telephone requirements).

(3) Suitable limits of voltage regulation necessary for rural distribution.

(4) Points that require attention in connection with wayleaves.

(5) Any other matters that should receive attention.

The above information is required for submission to the Electricity Commissioners as representing the views of those who are dealing practically with overhead lines.

(6) In any case, will those who have had experience of overhead line construction kindly send their names and addresses, also those of their friends who are similarly experienced, so that we can prepare a complete list of engineers having this especial experience.

The Overhead Lines Association definitely invites these replies from everyone with experience, whether he is connected with this Association or not.

Appointments Vacant.

Electrical engineer for the Mining Department of the Sheffield University. Stores clerk (£180) for the Bromley Corporation Electricity Department. Assistant secretary for the Association of Supervising Electrical Engineers. (See our advertisement pages to-day.)

Wages in the Engineering Industry.

A joint memorandum drawn up by the Engineering and Allied Employers' Association and the Engineering Joint Trades Wages Movement regarding the application of the recently-awarded 2s. per week increase to engineering workers, is published in the December *Journal* of the Amalgamated Engineering Union. This rules that the increase is payable (*a*) to time-workers on district rates, even where these rates are enhanced by increments in respect of ability or merit; it is not payable to men paid by results; (*b*) workers in receipt of an increment to their district time rates, if that increment is granted in respect of the workers in question not being employed on a basis of payment by results; a time-keeping bonus is not a system of payment by results; (*c*) to workers whose wages fluctuate in accordance with wages of those employed in other industries; (*d*) to staff and workers on "upstanding" wage.

Fatalities.

William Hornby, aged 16, whilst employed at the shipyard of the Lytham Ship Building Co., on December 1st received a fatal electric shock. At the inquest on December 5th it was stated that Hornby was at work on a platform in the machine shop when he grasped an electric wire with one hand, the other resting on the protecting rail. He received a shock of 440 V. A verdict of "Death from misadventure" was returned.

On December 7th, John Jones, employed by Messrs. Williams, electricians, of Clydach, Swansea Valley, received a shock of 220 V which proved fatal. Jones was seated in a chair with his feet on the table when one of his feet slipped and came down heavily upon an electric fire. The stove was smashed and the apparatus became "alive," the current passing through Jones's body.

A *Reuter* message from Bordeaux states that three persons received fatal electric shocks and three were injured on December 11th as the result of a motor-car having crashed into a pole carrying a high-pressure cable. The cable fell on the car, killing one of the passengers, and two pedestrians who attempted to give help were also killed.

Scholarship Bequest.

Among the public bequests willed by the late Mrs. Marryat, Dundee, is £200,000 for the foundation of travelling scholarships in engineering, electricity, aeronautics, and music, to be open to natives of Scotland only, and to be known as "Sir James Caird's Travelling Scholarships."

The Decimal Association.

On December 6th the annual general meeting of the Decimal Association was held at the Institution of Electrical Engineers, London. Sir Richard Gregory, LL.D., D.Sc., the retiring president, in a valedictory address, pointed out that in the matter of weights and measures the British Empire and the United States stood apart from the rest of the world and declined to enter an international commonwealth of commerce; every country outside the British Empire used decimal coinage, and our isolation was a handicap in the development of oversea trade. The pound and shilling could be decimalised by the introduction of a ten-penny shilling, simply increasing the token value of the existing copper coins by 20 per cent.

Sir Hugo Hirst, Bart., the new president, said that in his own business he had found the decimal system very useful for the development of export trade. The present was an opportune moment for raising the question, as we must have bigger exports, and unless we made it easy for purchasers to understand our values we should be handicapped. He urged that the trade associations should be induced to pass resolutions in favour of the movement.

Electrical Power Engineers' Association.

The recently-constituted London Local Group of the Technical Groups Scheme of the E.P.E.A. was inaugurated at a meeting held on Thursday, December 8th, when, under the chairmanship of Mr. W. J. Jeffery, A.M.I.E.E., a meeting consisting of some 150 engineers unanimously approved of the proposed scheme.

The chairman, in his opening remarks, referred to recent correspondence in the technical Press relative to the formation of some new associations and proposals in respect of others, and stated that the E.P.E.A. for the past twelve months had been giving consideration to the problem as a whole. It had put forward its scheme because it felt it was not in the best interests of engineers to encourage the formation of small and sectional societies. Mr. Jeffery then dealt in detail with the proposals of the scheme, which have been referred to previously in these columns.

Mr. J. R. Cowie, A.M.I.E.E., in support of the scheme, illustrated the advantage that had accrued to him as a young engineer in being called upon to take part in technical discussions, and suggested that from this point of view alone, the scheme would be of inestimable benefit to the young engineer. As a past member of the I.E.E. Council, he expressed the opinion that there was nothing in the proposed scheme that would in any way be detrimental to, or infringe upon, the functions of the major Institutions. On the other hand, the effect of the scheme would undoubtedly be to encourage—particularly on the part of the young engineer—a greater interest in the work of those Institutions.

Mr. P. Rycroft, M.B.E., M.I.E.E., speaking in support of the scheme, dealt with the matter more from the point of view of the engineers who were engaged on the manufacturing side of the profession, and congratulated the Association on the conception that sought to gather together in friendly conference the experts engaged on operation and the experts engaged on design and manufacture. He also referred to the advantages which accrued to the scheme arising from the support given to it by a highly-organised body like the E.P.E.A. The proposals were essentially economic, as for a very small inclusive fee the members of the Group would have the benefit of intimate contact with experts on a large variety of engineering matters. He supported the proposals of the Group because he believed that there would be no interference with either Civil, Electrical, or Mechanical Institutions, but that, on the contrary, great benefit would accrue to the Institutions as a result of the Groups.

The Price of Electricity in London.

On December 6th a statement was issued by the London and Home Counties Joint Electricity Authority with regard to the prices of electricity in London. Complaints had been received from the boroughs of Camberwell, Finsbury, and Wandsworth, which are supplied by the County of London Electric Supply Co., Ltd., at prices higher than those charged in adjoining areas. The Authority pointed out that the "standard prices" to be fixed under agreements between the London County Council and the London companies, embodied in the Acts of 1925, had no direct relation to the prices actually charged, but merely regulated the dividends that the companies were entitled to pay. If the prices charged were lower than the standard prices, and if profits were available, one-sixth of the amount involved in the reduction of prices to consumers might be used for the payment of additional dividends to shareholders. This arrangement was to take effect as from January 1st, 1926.

The London County Council and most of the companies had agreed as to the basic calculations, and it remained for the Electricity Commissioners to decide upon the manner in which the standard prices were to be determined for four classes of consumers, namely, traction, bulk, street lighting, and private consumers. The Commissioners had not yet come to a conclusion on this matter.

The Mayor of Wandsworth states that the consumers not only felt that they had been mulct of a large amount of money in the past, but that that money had been appropriated to capital account and would impoverish the consumers until 1971. They would have to pay 133 per cent. more for electricity than they would have done had not the excessive profits been capitalised. It is reported that Battersea has offered to supply electricity to Wandsworth at 4d. per kWh below what its citizens at present pay.

According to *The Times*, at a meeting of the London County Council last week, in reply to a question, Mr. E. M. Dence, chairman of the Special Committee on London Electricity, said he did not consider that there was any danger of electricity prices being increased as a result of the South-East England scheme being carried out. The probable effect of the scheme would be that the reduction in price of electricity in London would not be quite so great as would have resulted if the scheme of the Joint Electricity Authority for London had been carried into effect.

The London Traffic Scheme.

The Special Committee on Traffic of the London County Council has had under consideration the proposals for the co-ordination of London transport facilities put forward by the London and Home Counties Traffic Advisory Committee, and recommends as follows:—(*a*) That, in the opinion of the Council, a scheme for unified operation of London passenger traffic on the principles of a common management and a common fund should provide:—(i) That the interests of the travelling public should be adequately safeguarded, both as to services and as to fares. (ii) That the Council's tramway undertaking, which will remain its property under the scheme outlined, should be properly maintained. (iii) That the value of the Council's tramway undertaking should be equitably recognised, both as to capital and revenue, under the scheme. (iv) That the interests of any employés displaced as the result of unified operation should be safeguarded. (*b*) That the Special Committee on Traffic be authorised to enter into preliminary discussions with the other parties concerned, based on the principles of the foregoing report and resolution.

The First Electrical Association.

The following letter has been received:—

Forty-six years ago, to the very day, on Wednesday, December 14th, 1881, I was instrumental in starting the first Association of Electrical-Engineering Firms at a luncheon given at the "Ship and Turtle" by Admiral Sir E. Inglefield, chairman of a company of which I was then general manager, to the chairmen and managers of other companies. It did good work until about the time of the Westminster Aquarium Exhibition, when the Edison Company broke away, and other members did likewise.

Can any of your readers, having access to early records, assist me in finding the old Minute-book which was kept, in turn, by the secretaries of the various companies at whose offices the meetings of the Association were held?

Twyford, Berks, Wm. H. Massey.
Wednesday, 14th December, 1927.

Institution Notes.

Institution of Electrical Engineers.

A.M.I.E.E. EXAMINATION.—It has been decided in future to hold the examination in England in May and November annually, the next examination taking place in May, 1928. Entry forms should be submitted to the Secretary, Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2, from whom all particulars may be obtained, by April 1st for the May examination, and October 1st for the November examination.

At the examination held in October 36 candidates passed or completed the whole examination; nine passed Part I only, and four Part II only.

INFORMAL MEETING.—At the meeting on Monday, December 5th, with Mr. C. Lipman in the chair, Mr. N. E. Jackson opened a discussion on "Air Conditioning." He outlined the numerous applications of air treatment by heating, cooling, drying, or humidifying for various industries, and described typical installations for dealing with particular problems. He called attention to the need for further investigation and research into the possibilities of air conditioning, and pointed out that much of the heating and ventilating apparatus available was too big for normal use, so that it was often on a peak load for a very small proportion of its life, and some sectional regulation was therefore desirable.

Royal Institution.

The Juvenile Christmas Lectures at the Royal Institution will be delivered by Prof. E. N. da C. Andrade, on "Engines," commencing on Thursday, December 29th. The general courses of lectures before Easter will begin on Tuesday, January 17th, at 5.15, when Mr. P. R. Coursey delivers the first of two lectures on "The Development of Dielectrics for Electrical Condensers." On Thursday afternoons at the same hour there will be three lectures by Sir William Bragg on "Faraday's Notebooks," and two by Dr. J. J. Fox on "Optics and Chemistry." On Saturday afternoons, at 3 o'clock, there will be four lectures by Sir Ernest Rutherford on the "Transformation of Matter." The Friday evening meetings will commence on January 20th, when the discourse will be delivered by Sir William Bragg on "Photo-electricity."

Junior Institution of Engineers.

In a lecture on "Management Graphics" given before the Institution on December 9th, Mr. T. G. Rose said that too often there was no proper system of control of general management and internal administration. Many recorded figures were useless, information which was really vital was not available, and no effort was made to investigate cycles or trends, or cause and effect, so that the loyal efforts of subordinates were often nullified by a vagueness of policy and ignorance of facts amongst those in control. All sound management was based on comparison of results; the mere noting of a result was usually of little interest. Since in any business the results of different departments were bound to influence each other, and in many cases the relation of the result of one department to that of another was of great importance, it followed that unless some clear pictorial form of regarding these results were used, the difficulty of following figures from column to column became so great that comparisons were impossible. There were very few statistics which could not be shown with advantage as "trend charts," and by superimposing two trend charts, each showing actual results, cumulative results, and the moving annual total, an immediate answer could be obtained to the question: "Are we doing better or worse than last year"? No amount of statistics or schedules could be as effective. The methods which he advocated did not lead to an excessive accumulation of squared paper.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Mr. J. WATERS, district traffic superintendent, Liverpool Corporation Tramways Department, has retired on superannuation.

Mr. W. H. LAING celebrated his majority as manager of Lytham-St. Annes tramways this year.

Mr. JOHN TAYLOR, of the Blackburn Electricity Department, has been appointed mains engineer at Walsall.

Mr. W. VINCENT WAITE, M.I.Mech.E., A.M.I.E.E., has been appointed general works manager for Messrs. Robert Heath and Low Moor, Ltd., Low Moor Iron Works, Bradford.

The King of the Belgians is conferring upon M. BRAILLARD, the president of the Technical Commission of the Union International de Radiophonie the decoration of Chevalier of the Order of Leopold in recognition of his services to the cause of broadcasting.

Mr. J. P. GORTON has retired from the position of manager of the Weston-super-Mare branch of the Commercial Cable Co., where he has been for the past 40 years. His colleagues have presented him with a smoker's cabinet.

Councillor W. R. SANDERS has been elected chairman of the Buxton municipal electricity undertaking, and Councillor J. BRINDLEY vice-chairman for the ensuing year.

St. Helens Electricity Committee has interviewed five applicants for the position of borough electrical engineer, and the number has been reduced to three.

Mr. J. W. DAWSON, assistant electrical engineer to the Bradford City Tramways Department, has tendered his resignation, on medical advice.

Mr. FREDERICK FAVELL, A.M.I.E.E., of the Battersea electricity works, has been appointed engineering assistant at the Stoke-on-Trent Electricity Department.

Obituary.—MR. F. E. GRIPPER.—As was briefly mentioned in our last issue, Mr. Francis Edward Gripper, M.I.E.E., of Edmundsons' Electricity Corporation, passed away on Wednesday, December 7th, at his home, 14, Malbrook Road, Putney. Mr. Gripper's health had been very poor for a year,

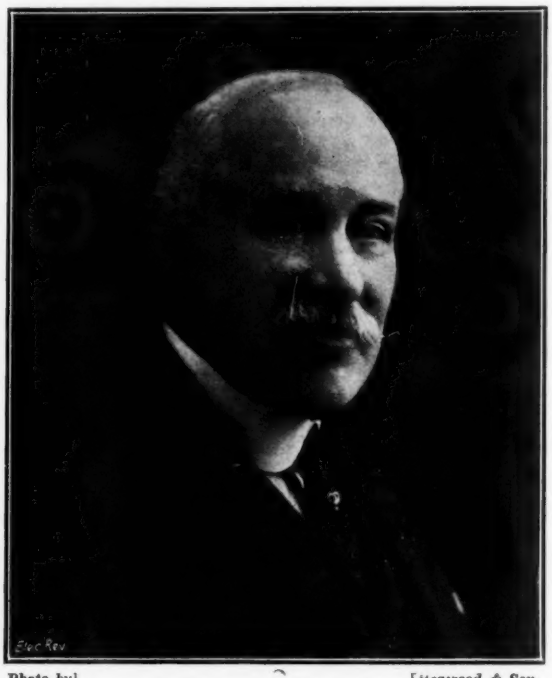


Photo by] [*Heawood & Son.*

The late Mr. F. E. Gripper.

and he was confined to his bed for seven weeks prior to his death. He was one of the pioneers of the electric lighting industry, and his genial disposition won for him a large number of friends. Mr. Gripper was born in 1852, was educated at Bootham School, York, and apprenticed in 1869 to Thompson Bros., of Bridgwater. In 1874 he joined the firm of J. Edmundson & Co., of Dublin and London, as manager of their London branch. Their business was largely that of lighting country houses by means of private gas plants. It was about this time that his company installed one of their large Wigham lighthouse gas burners in the clock tower of the Houses of Parliament, for the purpose of acting as a signal when the House of Commons was sitting. He was connected with some of the earliest applications of electricity for lighting and power purposes. About the year 1878 he carried out the experimental lighting of the Central Hall in the Houses of Parliament. Two Serrin arc lamps were used, and these were supplied with current from two Gramme arc-lighting dynamos. About the same time the Jablochkoff candle was introduced, and he carried out a temporary installation of these lamps on the Parade at Birchington, then a small village. The lighting was carried out by means of a portable steam engine and a De-Meritens generator, the cables being attached to the iron railings along the sea front. Mr. Gripper carried out some of the earliest installations of incandescent electric lighting; in 1881 he installed 250 lamps at the country house of the late Lord Amherst, the motor power being obtained from a gas engine supplied from the private gas works erected by Edmundsons many years before, the dynamo being of Siemens make. In 1883 he carried out quite a large number of private installations throughout the country and lighted up temporary installations for balls and parties, by means of large storage batteries, which were charged at the makers' works and sent long distances by road or rail. In 1894, under his management Edmundsons started the Shrewsbury electric supply undertaking, and from then onwards, under his guidance the starting of supply undertakings in provincial towns was carried out, about forty undertakings being started about the beginning of the present century. Mr. Gripper was general manager of Edmundsons Electricity Corporation, Ltd., until he retired from this position in 1918. He remained a director of Edmundsons' local companies until the beginning of the present year, when his failing health compelled him to resign those positions. He became a member of the Institution of Electrical Engineers in 1881, and was a member of the Council from 1903 to 1906. The funeral took place at Isleworth, Middlesex, Cemetery, on Monday.

MR. C. E. WOOD.—The death took place on December 2nd, at the age of 57 years, of Mr. C. Edgar Wood, who had for 17 years been secretary of Ward & Co., Ltd., electrical engineers, of Northgate, Dewsbury.

MR. G. H. THOMPSON.—The death is announced of Mr. George Heckels Thompson, electrical engineer, of Hetton-le-Hole and Houghton-le-Spring.

Wills.—The late Mr. ARTHUR GOODWIN, M.I.C.E., who was for many years connected with Messrs. C. A. Vandervell and Co., Ltd., left £1,778 (net personalty £1,485).

The late Mr. JAMES TAYLOR left £176,897 gross and £154,806 net personalty.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Mandaw Co., Ltd.—Private company. Registered December 5th. Capital, £20,000 in £1 shares. Objects: To acquire the goodwill and trade marks of "Mandaw" No. 259,874, 259,875, 262,702, 296,637, 297,267 and 308,936, hitherto the property of R. E. Jones, D. Selby, and A. J. Winter, and to carry on the business of dealers in electrical and mechanical novelties and appliances, manufacturers of and dealers in wireless apparatus and accessories, talking machines, kinematographs, and all instruments connected with photography, phonographs, &c. The first directors are:—R. E. Jones, "Cholmley," Bushey Hall Road, Bushey, Herts; O. Griffiths, 15, Fairmead Road, Holloway, N.7; F. W. Stevens, 81, Park Avenue South, Crouch End, N.8. Secretary: O. Griffiths. Registered office: 9-15, Whitecross Street, E.C.1.

African General Development Co., Ltd.—Private company. Registered December 6th. Capital, £8,000, in 12,000 preferred ordinary shares of 5s. each and 5,000 deferred ordinary shares of £1 each. Objects: To acquire, secure options on, hold and develop any concessions, grants, licences or claims, electrical and other undertakings, and any rights, powers, privileges or interests therein, and any lands, estates and plantations, and to carry on all kinds of agency, commission, commercial, manufacturing, mercantile, trading and financial business, &c. The subscribers (each with one deferred ordinary share) are:—A. W. Slade, 73, Nichols Square, Hackney Road, E.2, clerk; C. G. Cave, 21, Cholmondeley Avenue, Harlesden, N.W.10, clerk. The first directors are to be appointed by the subscribers. Solicitors: Mayo, Elder & Co., 10, Drapers' Gardens, E.C.

Pole Barn Wireless Works, Ltd.—Private company. Registered December 8th. Capital, £1,005 in £1 shares. Objects: To acquire the business of a distributor and relayer of radio television and/or other programmes, and radio engineer and manufacturer, now carried on by W. R. Dockrell at Frinton and district, Essex. The directors are:—W. R. Dockrell, Sandy Hook, Frinton-on-Sea; and Emily Dockrell, address not stated. Secretary (*pro. tem.*): E. McBean. Registered office: Pole Barn Lane, Frinton-on-Sea.

Synchronous Telegraph, Ltd.—Private company. Registered December 7th. Capital, £5,000 in £1 shares. Objects: To acquire the benefit of or interests in any invention, whether relating to synchronous telegraphy or not, and to carry on the business of electricians, electrical and mechanical engineers, &c. The directors are:—F. H. Muirhead, Harbledown, Warren Avenue, Farnborough, engineer; J. V. Foll, 14, Allington Road, Hendon, N.W.4; E. S. Heurtley, Plantation House, Caterham, consulting engineer.

West of England Electricity, Ltd.—Private company. Registered December 7th. Capital, £1,500 in £1 shares. Objects: To carry on the business of electricians, mechanical engineers and manufacturers, workers and dealers in electricity, motive power and light, &c. The directors are:—J. N. A. Houblon, Boxford, Newbury, Berks, chartered electrical engineer (director of Dulverton Electric Lighting Co.,

Ltd., and other companies); Margaret M. Partridge, 16, East Southernhay, Exeter, electrical engineer (director of Exe Valley Electricity Co., Ltd., and other companies); J. A. Purves, Thorpe Hall, Eaton Rise, Ealing, W.5, consulting engineer (director of Exe Valley Electricity Co., Ltd., and other companies); C. N. Tweed, Hursley, Honiton, Devon, solicitor (director of Honiton and District Electric Supply Co., Ltd.). Secretary: W. A. E. Stamp. Registered office: High Street, Honiton, Devon.

Rutland Electric Lamp Co., Ltd.—Private company. Registered December 2nd. Capital, £500 in £1 shares. To carry on the business of agents, manufacturers of and dealers in electric lamps, irons and kettles, domestic or other machines, batteries, and all other electrical appliances and materials, &c. The first directors are:—H. P. Killick, 28, Brunswick Square, Hove, manufacturers' agent; M. W. Hooker, 19, Winton Avenue, Westcliff-on-Sea, accountant. Registered office: Sentinel House, Southampton Row, W.C.1.

Colvern, Ltd.—Private company. Registered December 3rd. Capital, £5,000 in £1 shares. Objects: To acquire the business (including the trade mark, "Colvern") of manufacturers of radio apparatus now carried on by Collinsons Precision Screw Co., Ltd., at Mawneys Road, Romford, Essex. The directors are:—R. F. Collinson, 70, The Avenue, Highams Park, E.4; F. E. Collinson, Nightingale Hall, Woodford Green, Essex (director of Collinson's Precision Screw Co., Ltd.); H. A. Collinson, 85, Ulverstone Road, Walthamstow, E.17 (director of Collinson's Precision Screw Co., Ltd.) (all permanent, subject to each holding 250 fully-paid shares). Qualification of directors: £250 shares. Registered office: Colvern Works, Mawneys Road, Romford, Essex.

V. A. Ayliffe, Ltd.—Private company. Registered December 3rd. Capital, £100 in 1s. shares. Objects: To carry on the business of electrical engineers and contractors, dealers in wireless appliances and accessories, mechanical and consulting engineers, gas engineers and plumbers, &c. The first directors are:—V. A. Ayliffe, 2, Kingsway Avenue, Levenshulme, Manchester; W. Batt, 15, Kingsway, Levenshulme, Manchester.

Maudlin Engineering Co., Ltd.—Private company. Registered December 9th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers, fitters and repairers of and dealers in electrical materials, goods and appliances, electrical and other automobile accessories and fittings, accumulators, batteries, &c. The first directors are: E. H. Lowden, Boxgrove, near Chichester, garage proprietor (permanent); C. W. Lowden, Arnsford Cottage, Walberton, near Arundel, engineer.

Solanite, Ltd.—Private company. Registered December 9th. Capital, £500 in £1 shares. Objects: To acquire the applications for registration of patents numbered 27,796/27, 31,769/27, and 32,400/27, to adopt an agreement with G. W. Cussons and A. Wood, and to carry on the business of electrical and mechanical engineers, manufacturers of mechanical and electrical signs, scientific instruments, &c. The first directors are: G. W. Cussons, 104, Great Clowes Street, Lower Broughton, Manchester, engineer; A. Wood, 16, Haslemere Avenue, West Ealing, W.13, optician. Secretary: A. Wood. Registered office: Thanet House, 231, Strand, W.C.2.

Official Returns of Electrical Companies.

Radio Service (London), Ltd.—Satisfaction in full on November 15th, of debenture dated July 25th, 1927, securing £125.

W. J. Furse & Co., Ltd.—Capital, £35,000 in 9,000 cumulative preference and 26,000 ordinary shares of £1 each. Return dated May 21st, 1927. 9,000 preference and 21,029 ordinary shares taken up. £10,735 paid on 10,735 ordinary shares. £19,294 considered as paid on 9,000 cumulative preference and 10,294 ordinary shares. Mortgages and charges nil.

Wandsworth Electrical Manufacturing Co., Ltd.—Capital, £25,000 in £1 shares. Return dated July 7th, 1927. 17,230 shares taken up. £14,365 paid. £2,865 considered as paid. Mortgages and charges nil.

British Thomson-Houston Co., Ltd.—Capital, £4,000,000 in 2,000,000 7 per cent. cumulative preference and 2,000,000 ordinary shares of £1 each. Return dated June 7th, 1927. 1,500,000 preference and 2,000,000 ordinary shares taken up. £3,425,310 paid. £74,690 considered as paid. Mortgages and charges £1,556,255.

R. Pain & Sons, Ltd.—Capital, £6,000 in £1 shares. Return dated June 21st, 1926 (filed August 10th, 1927). 4,304 shares taken up. £4 paid. £4,300 considered as paid. Mortgages and charges nil.

South African Lighting Association, Ltd.—Capital, £100,000 in £10 shares. Return dated June 1st, 1927. 9,000 shares taken up. £88,950 paid. £1,050 considered as paid. Mortgages and charges: £25,000.

Edison Swan Cables, Ltd.—Trust deed dated November 24th, 1927, to secure £250,000 debentures, constituting a legal mortgage (*a*) on freehold land at Lydbrook Junction, English Bicknor, Glos., lands and Woodland Farm, known as Stonfield Farm, English Bicknor, and (*b*) leasehold land adjoining Lydbrook Junction, and a floating charge on the company's undertaking and other property, present and future, including any uncalled capital. Trustees: London Trust Co., Ltd., 14, Austin Friars, E.C.

L. N. Bennett, Ltd.—Issue on November 8th, 1927, of £50 debentures, part of a series already registered.

Asbestos and Electrical Fittings Co., Ltd.—Capital, £39,994 in £1 shares. Return dated June 15th, 1927. 10,006 shares taken up. £615 paid. £9,391 considered as paid. Mortgages and charges nil.

Babcock & Wilcox, Ltd.—Capital, £4,620,000 in 100,000 6 per cent. preference, 200,000 5 per cent. 2nd preference, and 4,320,000 ordinary shares of £1 each. Return dated May 4th, 1927. 100,000 6 per cent. preference, 179,056 5 per cent. 2nd preference, and 4,299,656 ordinary shares taken up. £1,029,884 paid on 179,056 5 per cent. second preference and 850,828 ordinary shares. £3,548,828 considered as paid on 100,000 6 per cent. preference and 3,448,828 ordinary shares. Mortgages and charges nil.

English Electric Co., Ltd.—Capital, £5,000,000 in 1,500,000 preference and 3,500,000 ordinary shares of £1 each. Return dated April 13th (filed May 18th), 1927. 983,565 preference and 1,664,023 ordinary shares taken up. £315,673 paid on 315,673 ordinary shares. £2,331,915 considered as paid on 983,565 preference and 1,348,350 ordinary shares. Mortgages and charges at date of return, £2,613,016 (£38,500 since paid off).

Multi-Way Earthing Clip, Ltd.—Debenture dated November 7th, 1927, to secure £2 576 12s. 10d., charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Capt. H. Hibbard, Westcourt, Gillingham, Kent.

Satisfaction in full on November 26th, 1927, of debentures dated November 6th, 1924, securing £600.

Windermere and District Electricity Supply Co., Ltd.—Capital, £50,000 in 5,000 cumulative preference, 2,000 preference, and 3,000 ordinary shares of £5 each. Return dated April 14th (filed August 4th), 1927. 5,000 cumulative preference, 1,000 preference, and 3,000 ordinary shares taken up. £23,850 paid on 3,040 cumulative preference and 1,730 ordinary shares. £21,150 considered as paid on 1,960 cumulative preference, 1,000 preference, and 1,270 ordinary shares. Mortgages and charges: £20,000.

Austin Walters & Son, Ltd.—Capital, £3 000 in £1 shares. Return dated June 9th, 1927. 1,002 shares taken up. £2 paid. £1,000 considered as paid. Mortgages and charges nil.

Marconi's Wireless Telegraph Co., Ltd.—Satisfactions to the extent of £74,403 between January 14th and November 15th, 1927, of debenture stock dated November 17th, 1922, securing £1,500,000.

Natwirco, Ltd.—H. E. Burgess, of 33, Carey Street, Lincoln's Inn, W.C.2, ceased to act as receiver on November 30th, 1927.

Harris, Williams (Manufacturers), Ltd. — Debenture dated November 18th, 1927, to secure £3,000, charged on the company's assets, including uncalled capital. Holders: T. Hall, 37, Grout Market, Newcastle-upon Tyne, and H. S. Sutherland, Carmel Road, Darlington.

Silgolum, Ltd.—Issue on November 16th, 1927, of £150 debentures, part of a series already registered.

City Notes.

Marconi's Wireless Telegraph Co., Ltd.

The directors' report for the year ended December 31st, 1926, shows a balance of profit of £325,958. Directors' fees, depreciation and debenture interest absorb £127,010, leaving a net profit of £198,948. The preference dividend is paid, and the directors recommend a dividend of 6d. per share on the ordinary shares (equal to 5 per cent. on the reduced ordinary capital); £75,000 is applied to a debenture redemption account; and £25,197 is carried forward. Cash in hand and at bankers is reduced by £73,847, and investments are £282,171 lower. Large capital expenditure was incurred in connection with the "beam" stations. The cash and investment position has since improved—from £320,000 to £800,000. The Australian beam service was opened on April 8th, the South African service on July 5th, and the Indian service on September 5th. The stations are carrying a large and increasing volume of traffic. The rate of working during the week ended December 3rd was at 34,840,000 words a year. The results will not be apparent until the end of next year. The directors hope to be in a position soon to make a statement with regard to a Far Eastern beam service. Satisfactory progress is being made by the

general business; for the first eleven months of 1927 it was substantially in excess of the figure for the corresponding period of last year. The reorganisation, which has been approved by the Court, has placed the company in a sound financial position. The report records the death of Mr. S. St. J. Steadman and the resignation of Lt.-Col. A. F. H. S. Simpson, C.M.G. Lord Inverforth, Major-Gen. Sir Frederick Sykes, Lord Wester Wemyss, Sir Charles C. Barrie, Mr. F. R. S. Balfour, Mr. P. A. Cooper, Mr. L. G. Sherlock and Sir Frederick J. Barthorpe have joined the board. The meeting is to be held on Thursday next, December 22nd.

It is announced that a dividend on the 7 per cent. cumulative preference shares will be paid on January 2nd, 1928, in respect of the half-year ending December 31st.

Brazilian Traction, Light and Power Co.

The board proposes to increase the authorised capital by $200,000,000 by the creation of 800,000 ordinary shares of $100 each. Upon the completion of the necessary formalities the present holders of ordinary shares will be offered one new share, at par, for each five shares held. This will involve the issue of about 220,000 new shares, leaving the balance of the authorised increase for future needs. The preference shareholders already have the option of converting their holdings into ordinary shares, and if conversions continue to be made the amount of the issue of new shares will be increased. It is further proposed to divide the $100 ordinary shares (including the new ones) into four shares of no par value. To maintain the relative voting strength the preference shares will each carry four votes. In a circular letter the president (Sir Alexander Mackenzie) sets out the reasons for the proposed arrangements. He shows that the rapid expansion of the company and the provision for future demands upon its services have necessitated very large expenditure upon extensions and improvements. To dispose of the large amount of surplus power which it has available the company has acquired several lighting and power businesses in territory contiguous to that now served. Large sums are being spent on extensions to the light, power and gas systems and on additions to rolling stock and transport equipment. Also in Sao Paulo and other places where new telephone concessions have been granted further immediate expenditure is necessary. The proposals will be submitted to a meeting in Toronto on January 5th.

Venezuela Telephone and Electrical Appliances Co., Ltd.

The annual meeting of this company, whose report was dealt with in our issue of December 2nd (p. 961), was held on December 7th. Mr. J. S. Austen (chairman) presided, and in the course of his speech said that, as was the nature of telephone companies, the increased profit earned during the year was only made possible by the expenditure of further capital. The introduction of the automatic system meant the scrapping of the whole of the old exchange equipment which had been erected at the cost of many thousands of pounds. They were bound to introduce the most up-to-date system for their subscribers; they hoped, however, that it would be a long time before an even better system was introduced. It was popularly supposed that the automatic system was much cheaper to operate than the manual system; that was not so in a small undertaking like theirs, for the savings would be almost negligible. The automatic plant required a great deal of supervision. The directors were offering shareholders new shares in the proportion of two for each six held, at the price of 21s. each; those shares would rank for dividend with the old shares. In conclusion, Mr. Austen paid a tribute to Mr. Wallis and the staff in Venezuela. He said that the company's friendly relations with the Government were largely due to Mr. Wallis.

Cape Electric Tramways, Ltd.

The report for the year ended June 30th last records a profit of £70,210. After paying debenture interest, &c., and adding the balance brought forward, there remains £62,012. To this is added £9,679 realised by the sale of the Hout Bay Hotel, making £71,691. From this £20,000 is transferred to reserve and £2,500 to the staff benefit fund. A final dividend of 3 per cent., free of tax, making 6 per cent., tax-free, for the year, is recommended, leaving £19,718 to be carried forward. The number of passengers and the gross receipts declined and although the total receipts of the combined tram and 'bus services were greater, there was a reduction in the net results. The unregulated competition of motor-'buses has become very severe. Various steps have been taken and are under consideration to deal with the matter, and the directors feel sure that the company will not be left unprotected. The capital expenditure during the year was £104,077, and represents the cost of motor-'buses, garages, and the duplication and extension of the tramway track in Cape Town and Port Elizabeth. The whole of the expenditure was met from the funds of the company. Meeting: December 21st.

Aluminium Corporation, Ltd.

There was a gross profit of £36,225 for the year ended December 31st, 1926, but after meeting debenture interest, &c., there is a deficit of £62,613. This is added to a loss of £13,734 brought forward, making a total deficit of £76,347 to be carried to the next account. The report states that the boring of the tunnel between Eigiau and Cowlyd Lakes proved more difficult than was anticipated. That part of the work is now done, but the inlet and outlet work has to be completed. Under an agreement with the associated company in Norway adequate supplies of aluminium for the rolling mill, &c., are now assured. The rolling-mill plant is to be extended and improved to reduce working costs; this work is expected to be completed by the middle of next month. The meeting is to be held to-day (Friday).

Dorman, Long & Co., Ltd.

In the course of his speech at the annual meeting on December 7th, the chairman (Sir Arthur J. Dorman, K.B.E.) made a reference to the reorganisation of the national electricity supply. He said that the programme of the Central Electricity Board for South-Eastern England had engaged the close attention of Messrs. Pearson and Dorman, Long. Under that programme it was not proposed at present to establish power stations in East Kent, but it was hoped that the representations which had been put forward might have the effect of altering that decision. At a later stage of the proceedings Mr. A. Dorman, the managing director, mentioned that during last year 88 million kWh of electricity had been generated at the company's iron and steel works from blast furnace gases and exhaust steam.

Altrincham Electric Supply, Ltd.

An extraordinary meeting was to be held this week to approve resolutions providing for the increasing of the company's capital to £210,000 by the creation of £103,350 7 per cent. cumulative second preference shares of £1 each and 133,000 deferred shares of 1s. each. It is proposed to capitalise £60,000 of the reserve and distribute this as a bonus to shareholders. It will take the form of 30,000 second preference shares for holders of the participating ordinary shares; and 23,350 second preference and 133,000 deferred shares for present holders of the deferred shares.

East African Power and Lighting Co., Ltd.

The company this week offered 270,000 7 per cent. cumulative £1 preference shares at 21s. each. The company supplies electricity in Nairobi and Mombasa, and in the eight months ended August 31st last sold 2,557,714 kWh from its two power stations, as compared with the corresponding period of 1926. The directors have under consideration the construction of an additional hydro-electric undertaking and further distribution work in the Nairobi district. The list was to close to-day (Friday) or earlier.

Stock Exchange Notices.

Dealings in the following have been specially allowed by the Committee under Rule 159:—

Power Investment Corporation.—185,493 shares of £1 each, fully paid, Nos. 74,508 to 259,800 and 999,801 to 1,000,000.

Venezuela Telephone and Electrical Appliances.—32,470 new preference shares of £1 each, fully paid, Nos. 245,001 to 277,470; 32,470 new ordinary shares of £1 each, fully paid, Nos. 210,001 to 242,470.

British Insulated Cables, Ltd.

We regret that in our last issue we gave currency to a report which had appeared in several directions to the effect that the directors of this company had just declared an interim dividend of 2½ per cent. on the ordinary shares, as compared with 5 per cent. last year. As a matter of fact, the interim dividend was paid on September 30th last at the rate of 5 per cent. per annum; the final dividend announcement may be expected in March next.

Buenos Aires Town and Docks Tramways, Ltd.

The gross receipts for the year ended June 30th last were £148,755, against £153,768 in the preceding year, and the net receipts £23,384, against £26,366. To this are added sundry receipts and the balance brought forward, and after providing for loss on exchange, debenture interest, &c., there remains £27,030. It is proposed to transfer £15,000 to reserve, to pay a dividend of 2 per cent., and to carry forward £2,128. Meeting: December 21st.

Electrolytic Zinc Co. of Australasia, Ltd.

The net profit for the year ended June 30th last was £390,077, as compared with £420,699 in 1925-26. The reserve for amortisation, depreciation and renewals was substantially increased (by £150,145), and shares in other companies rose from £17,700 to £38,950. The dividends on both the preferred and ordinary shares were maintained at 12 per cent.

Japanese Loan in New York.

Last week an issue of $7,680,000 of 6½ per cent. first mortgage bonds was floated in New York on behalf of the Shinyetsu Electric Power Co., of Japan. The Tokyo Electric Co. holds an interest in the Shinyetsu concern, which owns three large hydro-electric undertakings on the Nakatsu River.

Clayton Wagons, Ltd.

There was a loss of £27,293 on trading during the year ended June 30th last, as compared with a profit of £20,723 in the preceding year. The provision for bank interest and depreciation increases this loss to £48,974. After crediting the amount brought forward a deficit of £47,455 is carried forward

Tube Investments, Ltd.

At an extraordinary meeting following the annual meeting on December 7th a resolution was passed for the capitalisation of £181,736 of the reserve and its issue as bonus ordinary shares. Another resolution increased the capital to £1,550,000 by the creation of 300,000 new ordinary shares, and the directors were given power to further increase the capital as and when they pleased, up to a total of £2,500,000.

Fort William Electric Lighting Co., Ltd.

The annual report shows that the profit for the past year was £1,147, and it is proposed to pay a dividend of 5 per cent. Under an agreement with the Town Council the company has undertaken to provide additional plant estimated to cost £2,500.

Associated Gas and Electric Co.

The directors are offering additional Class "A" stock to existing shareholders, in the proportion of one to each five shares held, at the price of $40 per share. The proceeds of the issue (approximately 200,000 shares) will be used for the redemption of prior securities, new construction, &c.

Mann, Egerton & Co., Ltd.

The profit for the year ended September 30th was £34,510, as compared with £20,675. The annual meeting will be held at Norwich on December 23rd. The directors propose to pay 8 per cent. on the preference shares (absorbing £16,833); to pay a dividend of 9d. per share on the ordinary shares (£2,423); to pay 5 per cent. on the funding certificates (£1,425); to allocate £8,000 to the redemption of the funding certificates; and to carry forward £11,826, subject to income tax on the amount of funding certificates redeemed.

Anglo-Argentine Tramways Co., Ltd.

The dividends in respect of the half-year ending December 31st have been declared on the 5½ per cent. cumulative first preference and the 6 per cent. second cumulative preference shares.

Victoria Falls and Transvaal Power Co., Ltd.

The directors have declared a dividend of 3 per cent. on the preference shares for the half year ending December 31st, together with a further dividend of 3 per cent. in respect of participating rights. An interim dividend of 3 per cent. is also declared on the ordinary shares. Similar rates were paid last year.

Petters, Ltd.

The directors have declared an interim dividend on the 7½ per cent. cumulative preference shares in respect of the half-year ended September 30th.

Yorkshire (West Riding) Electric Tramways Co., Ltd.

The directors have declared the balance of dividend (3 per cent.) upon the 6 per cent. cumulative preference shares for the current year.

Power Gas Corporation, Ltd.

Out of a net profit of £15,520 for 1926-27 (against £6,233), the directors are paying a dividend of 5 per cent.

Globe Telegraph and Trust Co., Ltd.

A quarterly dividend of 5s. per share (net) has been declared on the ordinary shares.

Shawinigan Water and Power Co.

A dividend of $0.5 per common share has been declared in respect of the quarter ending December 31st.

St. Maurice Power Co.

The common shares are to receive a dividend of $1 per share for the quarter ending December 31st.

Sphere Investment Trust, Ltd.

An interim dividend at the rate of 4 per cent. per annum has been declared on the ordinary shares.

International Telephone and Telegraph Corporation.

The directors have declared the regular quarterly dividend of 1½ per cent., payable January 15th.

Great Northern Telegraph Co. (of Denmark).

A half-yearly dividend at the rate of 5 per cent. per annum has been declared.

French Companies.

The *Compagnie L'Union Electrique* records net profits of 258,000 fr. for 1926-27, rising to 542,000 fr. with the balance brought forward. This balance has been carried to 1927-28.

The *Société les Exploitations Electriques* reports net profits of 2,018,000 fr. for 1926-27, about the same as in the previous year. It is proposed to increase the rate of distribution from 17.50 fr. to 18.75 fr. per share.

Stocks and Shares.

MONDAY EVENING.

ACTIVITY persists in various Stock Exchange markets, but the influence of window-dressing becomes a little more noticeable each week. This factor is offset by the hope, amounting to something like conviction, that cheaper money rates lie just on the other side of the New Year. Such expectations have been too frequently disappointed in the past for them to be accepted—at any rate by the cautious—with complete confidence, though it is generally admitted that the Government is likely to introduce a new conversion scheme early in 1928. For the success of such an operation, it is held that easy money conditions are essential: hence the hope of a 4 per cent. Bank Rate; hence, too, the strength of all gilt-edged securities in the face of the new issues that flood the markets.

Debenture Stocks Obtainable.

County of London Electric 5 per cent. debenture stock, to quote a typical gilt-edged example, has moved up to 100 ex the recently-paid interest. The stock can still be bought free of the onerous £1 per cent. Government-stamp duty. No great supply of electrical debenture stocks is on offer. Electrical Finance and Securities 5½ per cent. debenture can be bought at 99 ex dividend; Traction and General Investment 4½ per cent. debenture is available at 88¾, also free of stamp and fee, the yield on the money, at this price, being £5 1s. per cent. The stock is redeemable at 100 in 1974. Llanelly Electric 5 per cent. debenture, January and July interest, at 95, returns £5 5s. 3d. on the money. Newcastle-on-Tyne 6 per cent. second debenture at 105, March and September, gives £5 14s. 3d.: this stock is repayable at 100 in 1949, or earlier at 102½.

Electric Supply.

Our list of prices this week shows a gain of 9d. each in Bournemouth and Poole ordinary, and in City Lights. Urbans put on 1/16 to 36s. 3d. Whitehall Electric Investments 7 per cent. preference hardened to 21s. 3d. Lack of price-changes in an investment market, such as this, is no criterion of the amount of business transacted. As a matter of fact, business has been fairly active in the electric supply section. Chiswick ordinary old and new at 50s. 6d. bid were a good market, with a number of transactions taking place. Newcastle and District ordinary have been wanted at 22s. 6d. Isle of Thanet ordinary found support at 20s. in anticipation of a 5 per cent. dividend for 1927, as against 3 per cent. for 1926. An increase was foreshadowed by the chairman in his speech at the last annual meeting. Beaver Trusts at 21s. 9d. are 6d. to the good.

As regards overseas issues, Atlas new 6 per cent. debenture is up to 101½ bid, a rise of almost a point. The ordinary and preference are unchanged. The East African Light and Power Company is about to issue 270,000 7 per cent. cumulative preference shares at 21s. Perak River Hydro-Electric 7 per cent. participating debenture has again been in demand, and is up to 107½. The South American Light and Power Company announces the sale of its undertaking to the Italo-Argentine Electricity Company, for £100,000 in cash and 125,000 £1 shares of the new company. The board states that it is not its intention to wind up, "but to take advantage of any opportunities which may present themselves of usefully employing the organisation and liquid assets of the company." With the exception of a rise of a point in Mexican Light and Power common, to 56, there are no movements in Mexicans to report.

Brazilian Traction.

The Brazilian Traction, Light and Power Company has issued an interesting scheme for the re-arrangement of the ordinary share capital. In the first instance, the directors are creating a further 800,000 ordinary shares of $100 each, in order to provide fresh funds to finance purchases of Light and Power business recently acquired, and for the payment, in June, 1929, of the $6,000,000 Sao Paulo Tramways Light and Power first mortgage debentures. The company proposes to issue 220,000 $100 ordinary shares at par, on the basis of one new share for every five shares held. When this is done, the board intends to exchange each $100 ordinary share for four ordinary shares of no par value. To safeguard the position of the preference shares, which at the moment carry one vote per share and are convertible at par into $100 ordinary shares, it is proposed to give to each preference share in the future four votes, and to alter the conversion rights so that each preference share will be convertible into four of the no par value shares. In the circular which has been issued to the proprietors, the company gives figures showing the extraordinary growth of this concern since its inception in 1912. The statistics bear repetition:—

	1912.	1926.
Number of passengers carried on tramways	231,385,668	547,150,618
Number of passengers carried on 'buses	—	4,928,109
Kilowatt hours sold	191,749,863	526,317,699
Cubic metres of gas sold	40,728,206	81,571,030
Number of telephones in service	10,161	83,677

In the same period the population of the City of Rio de Janeiro has grown from 950,000 to 1,600,000, and that of the City of Sao Paulo from 425,000 to 800,000, all these figures being approximate. The prices, prior to the announcement of the scheme, were 233 and 192½ x.d., for common and preferred respectively. Subsequent profit-taking resulted in a drop of 5½ points in the common and 4 in the preference.

Tramways.

London tramways continues in the doldrums. London United Tramways preference are lower at 7s. 6d., and the 4 per cent. debenture lost a point at 56½. It is more than probable that these securities will incline to dullness until it is known whether the Government intends to bring in a Bill for the co-ordination of London traffic facilities in the Spring Session of 1928. Lancashire United Transports are still in demand at 9s. The market thinks that these shares will stand higher by next spring. British Electric Traction securities are again unchanged.

Foreign and colonial tramways, with the exception of Brazilian Tractions, call for little comment. La Platas, Paras and Pernambucos are featureless. Cape Electric Tramways at 17s. 6d. were unmoved on the reduction of the dividend to 6 per cent. tax free, as against 7 per cent. tax free for the previous year. In the report the board points out that the motor-omnibuses working in opposition to the company are increasing in number, and are permitted to run without any regulations whatever, thus forming an unfair competition which has become very severe. It is to be hoped that steps will be taken to regulate unrestricted competition before this company, the pioneer of street transportation in Cape Town, gets into the parlous position of some of its compeers in England.

Cable Stocks.

It cannot be said that the cable group is particularly happy, although the severity of the slump has been stayed, and there was a little bargain-hunting on the part of speculative investors. The Eastern Company, pressed to make a statement on the subject of cable and wireless, replied that it would be improper to do so in view of official assurance that the Post Office would be in a position to deal, before the end of the year, with the situation placed in front of them. Eastern ordinary stock is nominally unchanged at the extremely wide price of 145-155 but has changed hands down to 143. Eastern Extensions have dropped 15s. to 14¾, Globes 10s. to 15s., and the preference 7s. 6d. to 10½, while Westerns at 14 xd. are about the same as they were. Anglo-Americans are flat at 96 for the preferred and 24 for the deferred. Indo-Europeans maintain their position at 40, but Great Northerns weakened to 37½. Marconis continue to be a firm market at 31s. 3d.; the price has been up to 32s. 6d. A boomlet occurred in Canadian Marconis, the price being run up to 11s. 3d. (comparing with 6s. 6d. at one time last month) before reaction lowered the quotation to 8s. 9d. on a statement from the chairman, at Toronto, that "there is no prospect in sight warranting the trading in the shares."

British Columbia Electric Railway stocks, undismayed by the setback in Brazilian Tractions—there seems a queer affinity about the movements of the two, as a rule—have gone ahead further, on the chairman's speech at the recent meeting reported last week (ELEC. REV., p. 1004). Allowing for dividend-deductions, the prices of deferred and preferred are both better.

Manufacturing and Equipment.

Telegraph Constructions have made no recovery from their fall of £4, and irregularity characterises the list of cable equipment shares. Henleys are down 2s. 6d., to 5½, and Siemens 1s. 3d. to 30s. British Insulated, on the other hand, regained the loss of last week with a rise to 4 1/16. Callenders rallied to 4. Johnson & Phillips spurted sharply to 53s. upon a report that the Burndept Company had repaid its loan to Johnson & Phillips. British Aluminiums fell back to 45s. 6d. English Electrics came on offer again, the ordinary going back to 8s. 9d., the preference to 11s. 3d.

Venezuela Telephone New Shares.

The Venezuela Telephone & Electrical Appliances Company has distributed new ordinary and new preference shares to its proprietors in the proportion of two in six—one ordinary and one preference for every six old shares. The new are offered at a guinea each, and rank for dividend in the same way as the old. A premium of 2s. to 3s. has been established on the new shares. Dealings have not been assisted by the company having issued allotment letters of new preference and ordinary shares on the same form, and declining to divide the one from the other. The majority of companies endeavour to meet the reasonable wishes of their proprietors who, when two classes of shares are being allotted, expect provision to be made for splitting.

The rubber share market is quiet. Iron and steel issues move somewhat erratically. Business in this section comes in spasms, and the volume of general orders is insufficient to make the list with a decisive tendency.

Share List of Electrical Companies.

	Nom. £	Dividend. 1926.	Dividend. 1926.	Price Dec 12 1927.	Rise or fall.	Yield. p.c.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	14	14	59/3	+9d.	4 14 8
Brompton Ordinary	1	10	8¾	24/6	—	5 14 8
Charing Cross Ordinary	1	15	8½	25/6	—	5 9 10
do. do. 4½ Pref.	1	4½	4½	17/6	—	5 2 10
Chelsea	1	12	8¾	24/6	—	5 9 10
City of London	1	15	7½	30/-	+9d.	4 0 0
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Clyde Valley	1	8	8	32/-	−6d.	5 0 0
County of London	1	15	7½	28 6	—	4 18 8
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	8	10	45/-	—	4 8 11
do. 7% Pref.	1	6	7	24/6	—	5 14 3
Elec. Supply Corporation	1	10	10	33 9	—	5 18 6
Kensington Ordinary	1	15	8	25/6	—	5 9 10
Lancs. Light and Power	1	7½	7½	27/-	—	5 11 1
London Electric	1	10	8½	24/6	—	5 14 8
do. do. 6% Pref.	1	6	6	5¾	—	5 11 8
Metropolitan	1	11	8	30/-	—	4 13 4
do. 4½% Pref.	1	4½	4½	17/-	—	5 8 6
Midland Counties	1	5¾	6	24/-	—	5 0 10
Newcastle-on-Tyne Ordinary	1	7	5	23/9	—	4 4 8
do. 5% Pref.	1	5	5	17/6	—	5 14 3
do. 7% Pref.	1	7	7	25/-	—	5 12 0
Notting Hill 6% Pref.	10	6	6	10¾	—	5 11 7
North Met. Elec. 6% Pref.	1	6	6	22 6	—	5 6 8
St. James' and Pall Mall	5	17½	8	26/-	—	5 7 8
South London	1	15	8½	25/-	—	5 12 0
South Metropolitan Pref.	1	7	7	1¼	—	6 8 0
Urban Ordinary	1	7	7	1¼	+1/16	8 17 2
do. 6% Pref.	1	6	6	1 1/16	—	5 18 0
Westminster Ordinary	1	15	8¼	25/6	—	5 9 10
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	21/3	+3d.	7 1 2
Yorkshire Elec.	1	8	8	32/-	—	5 0 0
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	71	—	5 12 8
Metropolitan	,,	5	5	64	+½	4 13 9
do. District	,,	3½	3½	63½	—	5 10 3
Underground Electric	£1	Nil	1½	19/-	—	1 11 7
do. do. Income	Bonds	6	6	105	—	5 14 3
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	96	−4	6 4 9
do. Def.	,,	1½	1½	24	−¾	6 4 9
Automatic Telephone	1	3	10	46/3	−1/9	4 6 6
Chili Telephone	5	5	6	7¾	—	3 18 8
Eastern Extension	10	10	10	14¾	−¾	6 15 7
Eastern Tel. Ord.	Stock	10	10	1 0	−5	6 13 4
Globe Tel. and T. Ord.	10	10	10	15	−½	6 13 4
do. do. Pref.	10	6	6	10½	−¾	5 4 3
Great Northern Tel.	10	20	20	37½	−½	5 7 5
Indo-European	25	8¾	10	40	—	*6 5 0
Marconi	1	Nil	Nil	31/3	—	
Marconi-Marine	1	7½	8¾	30/-	—	5 16 8
Oriental Telephone Ord.	1	12	12	51/3	—	*4 13 6
United R. Plate Tel.	5	8	8	7¾	−¼	*4 2 1
Western Telegraph	10	10	10	14xd	—	*7 2 10
HOME AND FOREIGN TRAMS, &c.						
Anglo-Arg. Trams First Pref.	5	5¼	5¼	8½	—	7 17 2
do. do. 2nd Pref.	5	6	6	8 5/8	—	8 8 6
do. do. 5% Deb.	Stock	5	5	74½	—	6 14 3
British Electric Traction Def. Ord.	,,	8	8	500	—	... ...
do. do. 8% Pref. Ord.	,,	8	8	123½	—	6 9 7
Brazil Traction	100	5	6	227½	−7½	2 12 8
Brit. Columbia Elec. Ry. Pcs.	Stock	5	5	95½	—	5 6 11
do. do. Preferred	...	6¼	6¼	143¼xd	+3	4 7 1
do. do. Deferred	,,		8	188xd	+5	*4 7 5
do. do. Deb.	,,	4¼	4¼	80½	—	5 5 11
London & Sub. Trac. 5% Pref.	1	Nil	Nil	3/-	—	... ...
London United Tram. Deb.	Stock	4	4	56½	−1	7 1 7
Mexico Trams, 5% Bonds	—	5	5	72	—	6 18 11
Mexican Light Common	100	Nil	Nil	56	+1	Nil
do. Pref.	100	Nil	Nil	76	—	Nil
do. 1st Bonds	—	5	5	78½	—	6 7 5
Yorkshire (West Riding)	1	5	—	7/6	—	... ...
MANUFACTURING COMPANIES.						
Babcock & Wilcox	13	13	8	—	4 6 8
British Aluminium Ord.	1	12½	10	45/6	- 1/-	4 8 0
British Elec. Transformer Pref.	1	Nil	7	18/9	—	7 1- 0
British Insulated Ord.	1	15	15	4¾	+1/16	8 12 10
Brush Ord.	1	10	10	28/9	—	6 18 4
Callenders	1	15	15	4	+1/16	8 15 0
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 8
Crompton Parkinson Pref. Ord.	1	Nil	Nil	16/-	—	... ...
Edison-Swan	4/-	10	10	10/-	—	4 0 0
do. 5% Deb.	Stock	5	5	90	—	5 11 1
Electric Construction	1	10	7½	28/9	—	5 4 4
Enfield Cable Pref.	1	7½	7½	25/-	—	6 0 0
English Electric	1	Nil	Nil	8/9	- 8d	... ...
do. do. Pref.	1	8	—	11 3	-9d	... ...
Gen. Elec. Pref.	1	6½	6½	24/-xd	—	5 8 4
do. Ord.	1	7½	7½	34/-	—	4 6 1
Henley	1	20	25	102/6	−2/6	4 17 8
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	5	—	16/-	—	... ...
Johnson & Phillips	1	17½	12½	49/3	—	5 1 8
Met.-Vickers Ord.	1	8	8	30/-	—	5 6 6
do. Pref.	2	8	8	2 3/4	—	6 4 8
Siemens Ord.	1	7	7½	30/-	−1/3	5 0 0
Telegraph Construction	12	10	10	25½	—	*4 14 1

* Dividends paid free of Income Tax.

An Exhibition of Lighting Fittings.

Messrs. Osler & Faraday's New Showrooms.

IT is a veritable sign of continued vigour when a firm with well over a century's history arranges such up-to-date and admirable showrooms as have recently been opened by Messrs. Osler & Faraday, Ltd., at Newman Street, W.1. The firm of Osler dated back to 1807 and was eminent in the ornamental glassware industry before electric lighting was thought of; Faraday's commenced seven years later and reached a similar position in the manufacture of artistic metalwork. The combination of the two firms some time ago not only added their experience and assets together, but on account of the complementary nature of their businesses, considerably enhanced the possibilities of production.

Fig. 1.—The Entrance Hall of Messrs. Osler & Faraday's Showrooms.

Some of the results are seen in the new showrooms to which we recently paid a visit. These consist of a suite of over a dozen apartments, each of which is furnished and decorated in a distinctive manner to form an appropriate setting for a particular style of fitting. Thus for the display of wrought ironwork the severe atmosphere of the Tudor period is reproduced, while for the massive crystal candelabra the gilt ornamentation of the Empire period is used. The showrooms are not devoted wholly to "classic" designs, however, for in numerous fittings which are shown the modern note appears. Moreover, art does not exclude utility. While there are models which are purely artistic (that is, not primarily to provide illumination) the majority of the fittings on view combine beauty with usefulness. We think that there is none which is useful and not artistic.

It must be said that the main part of the display is devoted to fittings which are not, shall we say, low-priced, and the tendency is to confirm the impression that the house confines its attention to the expensive. This is not the case, for cheaper fittings are also exhibited in large numbers; in every instance, however, the excellent finish which characterises the firm's work is apparent. Here and there throughout the various apartments appear original designs many years old which can be reproduced exactly by the firm's craftsmen; in many cases only a seasoned expert could say at once whether the fitting really belonged to an earlier period or was a reproduction.

An additional attraction to the connoisseur is an exhibition of 200 lamps of all periods, several of which have historical connections.

The exterior of "Lanthorne House" is in keeping with the interior. The premises have an attractive eighteenth-century façade with a row of obelisks and wrought-iron lamps.

It is impossible to deal adequately in words with the excellent show which Messrs. Osler & Faraday have arranged. The two illustrations which accompany these notes convey a rather better idea of the showrooms, but a visit must be paid to appreciate what can be done with metal, wood, glass, silk and vellum by artists and craftsmen.

Lighting Glassware Showrooms.

A number of new designs of lighting fittings are on view at the showrooms of Messrs. Richson & Co. (1925), Ltd., 113, Oxford Street, W.1. One feature is a range of porcelain models of animals with transparent eyes, equipped with small interior lamps. A new series of bronze statuettes bearing torches and lamps of other shapes is also on view. Another novelty is a decanter-shaped fitting of iridescent glass which is filled with water, a lamp being fitted in the top. Baskets of realistic imitation roses, each flower having a small lamp in its centre, make a very attractive show. There are also all-glass hall lanterns which look exactly like wrought-iron lamps. Other special fittings are new decorated glass bowls, glass Chinese lanterns, and crystal table centres equipped with candle lamps.

Another showroom of interest is that of the New Italian Art Association, Ltd., 57-58, Wells Street, W.1. This company's business was originally devoted almost exclusively to alabaster, but it now consists mainly of decorative glassware. This company claims that it does not merely concentrate on providing for the "lighting season"; it does an all-the-year-round trade with factors, and buys large quantities several times a year. Most of the ware is imported under arrangements which make it as cheap for the factor as direct importation from the factory. The company also has an arrangement with a large British glass-producing concern for the sale of its electric lighting fittings. Practically all the business done is domestic, and in the showrooms are many examples of really excellent work. Glassware in imitation of alabaster is one special feature, but the display is varied, and includes beautifully decorated bowls and shades. One interesting development is a range of small glass shades closely imitating silk, but without its dust-collecting propensities.

Fig. 2.—One of the many Apartments.

The Import Trade of China.

Statistics for 1925 and 1926 Compared.

THE following table shows the imports into China last year of electrical and allied material and machinery. The corresponding figures for 1925 are given and notes of increases or decreases added. It is not a little striking that in spite of the revolutionary disturbances that occurred during the period in question trade in these goods shows an increase under every heading except power plant. It is true that in 1925 imports were low—particularly electrical materials and fittings, but if the 1926 figures are compared with those for 1924, increases are also found to have taken place in that group as well as in telegraph and telephone material, and scientific instruments and apparatus. Machinery for electric power stations showed an advance in 1925 on 1924, but although declining in 1926, it was still above the 1924 level. Japan's share on the whole showed a greater increase than that of Great Britain. It is probable that a great deal of the trade credited to Hong-Kong was transacted with the United Kingdom. The Haikwan tael fell in average value from 3s. 5¾d. in 1925 to 3s. 1¾d. in 1926.

Country whence imported.	1925. Taels. (thous.)	1926. Taels. (thous.)	Inc. or dec. (thous.)
Brass and yellow metal; bars, sheets, wire, &c.—			
Total	1,377	1,650	+ 273
Hong-Kong	305	181	− 124
Great Britain	59	30	− 29
Japan	911	1,256	+ 345
Belgium	14	3	− 11
United States	11	5	− 6
Germany	72	154	+ 82
France	7	3	− 4
Copper bars, rods, sheets, plates, nails, and wire.—			
Total	923	1,110	+ 187
Hong-Kong	41	29	− 12
Great Britain	90	26	− 64
Japan	617	975	+ 358
Germany	38	41	+ 3
Belgium	1	2	+ 1
United States	128	13	− 115
Electrical materials and fittings.—			
Total	6,890	8,941	+2,051
Hong-Kong	421	379	− 42
Great Britain	1,199	1,666	+ 467
Italy	65	90	+ 25
Japan	2,367	3,407	+1,040
Canada	14	46	+ 32
United States	851	1,422	+ 571
Sweden	14	31	+ 17
Belgium	123	109	− 14
Holland	283	194	− 89
France	122	215	+ 93
Germany	1,393	1,351	− 42
Propelling machinery, such as boilers, turbines, &c.—			
Total	1,920	1,916	− 4
Great Britain	892	683	− 209
Japan	93	202	+ 109
United States	296	298	+ 2
Sweden	65	148	+ 83
Germany	275	344	+ 69
Belgium	281	93	− 188
Italy	13	9	− 4
Telegraph and telephone material.—			
Total	958	2,053	+1,095
Hong-Kong	45	49	+ 4
Great Britain	194	141	− 53
Japan	255	271	+ 16
Canada	6	9	+ 3
United States	76	72	− 4
Sweden	118	96	− 22
Germany	167	875	+ 708
Belgium	8	165	+ 157
France	69	93	+ 24
Italy	−	147	+ 147
Scientific instruments and apparatus.—			
Total	988	1,318	+ 330
Great Britain	128	138	+ 10
Germany	228	377	+ 149
Belgium	4	1	− 3
France	29	37	+ 8
Japan	321	471	+ 150
United States	203	212	+ 9
Machinery for electric power stations.—			
Total	858	831	− 27
From Great Britain	345	186	− 159
,, Germany	167	130	− 37
,, Japan	105	160	+ 55
,, United States	113	135	+ 22
,, Hong-Kong	33	165	+ 132

Russian Electrical Imports.

The Ability of the Home Factories to Meet the Demand: Divergent Views.

VERY little information has hitherto been available concerning the imports of electrical machinery and accessories into Soviet Russia under the existing *régime*. Even now particulars of the subject would probably not have been published were it not for the fact that a correspondent of a Moscow economic newspaper recently suggested that it was necessary largely to increase the imports of electrical machinery and plant simultaneously with the development of the native production. Obviously the correspondent is under the impression, rightly or wrongly, that the national demand is growing to such an extent as to render it impossible for the State works, despite their increasing output, to cope with the requirements. On the other hand the advocates of the national manufacturing industry have such confidence in it that they have recommended that even the 50,000-h.p. hydro-electric sets for the proposed 650,000-h.p. generating station on the Dnieper, should be constructed in Russia, if indeed it has not already been decided that the work shall be executed by the State manufacturing works.

Mr. D. Fridman has now come forward in the Moscow newspaper in question in advocacy of national work and with the object of showing that it is not only not necessary to increase the import trade, but that it is actually decreasing and ought to be further diminished in sympathy with the expanding production of the native works. He quotes some interesting figures which, if reliable, tend to show that the imports of purely electrical machinery and plant in recent years have not amounted by a long way to the sum which one might have been led to expect from the Soviet reports of orders placed abroad and of actual deliveries from other countries, apart from purely mechanical plant.

It is stated, for instance, that the Russian consumption of electrical products in 1913, based upon pre-war price lists, amounted to 144,000,000 roubles, of which imports formed 44.5 per cent. In recent years and taking the same price lists into consideration, the consumption and the share percentage of the imports entering into the consumption are stated to have been as follows for the years mentioned, each of which terminated with September 30th :—

Year.	Consumption in million roubles.	Percentage of the imports.
1923-24 ...	58 ...	26.1
1924-25 ...	102 ...	23.0
1925-26 ...	146 ...	22.3
1926-27 ...	180 ...	20.0

It will be seen that the percentage of the imports has constantly decreased. Special consideration of the imports in 1925-26 shows that the composition of those, to the value of 17,000,000 roubles, was as follows :—

Electrical machines, transformers and apparatus, 10,300,000 roubles; lamps, 1,900,000 roubles; and other products, 4,800,000 roubles.

The remainder consisted chiefly of measuring apparatus and installation materials. Further analysis indicates that the imports were distributed over two groups: plant for regional stations representing 60 per cent. and current marketable goods the balance of 40 per cent.

Mr. Fridman proceeds to point out that there is no longer any necessity to import lamps as these are now made in superabundance in Russia, which, moreover, is also occupied in exporting lamps. A similar observation is made concerning measuring apparatus, and standard machines; the latter are being more largely turned out by the State Electrical Trust (High Tension) and are also being made by the concession works of the Allmanna Svenska Elektriska A.B. and by new works. There is also, it is stated, no need to import cables and wires or heavy accumulators. On the other hand special machines, it is thought, will still have to be obtained from abroad for some time, such, for instance, as generators for large steam turbines, apparatus for 115,000 volts, and individual machines and apparatus.

At the same time Mr. Fridman suggests that Soviet economists, if they still rush to place orders abroad, do so because they lack confidence in national manufactures; because they desire to make trips abroad and to buy cheaply; and, because of the long period required by the Russian works to execute delivery. On the last point it is explained that the Soviet works are kept short of funds and are therefore unable to get sufficient supplies of raw and semi-finished materials from abroad for conversion into manufactures, and that it is difficult to get licences for these particular imports, whereas it is very easy for large sums to be sent out of the country in connection with the placing of orders with foreign firms. In conclusion, it is submitted that imports are needed, but in the form of copper, rubber, tin, &c.

A Large Diesel Installation.

New 1,200-kW heavy-oil-engine generating plant recently installed at the Shorts Gardens power station of the Charing Cross Electricity Supply Co., Ltd.

THE inauguration, on November 17th, of a new generating set at the Shorts Gardens power station of the Charing Cross Electricity Supply Co., Ltd., by Mr. W. F. Fladgate, M.V.O., chairman of the company, marks important steps in both the progress of the supply company and the development of the Diesel oil engine in this country. The prime mover, which is claimed to be the largest of its type yet installed in any power station in Great Britain, is a

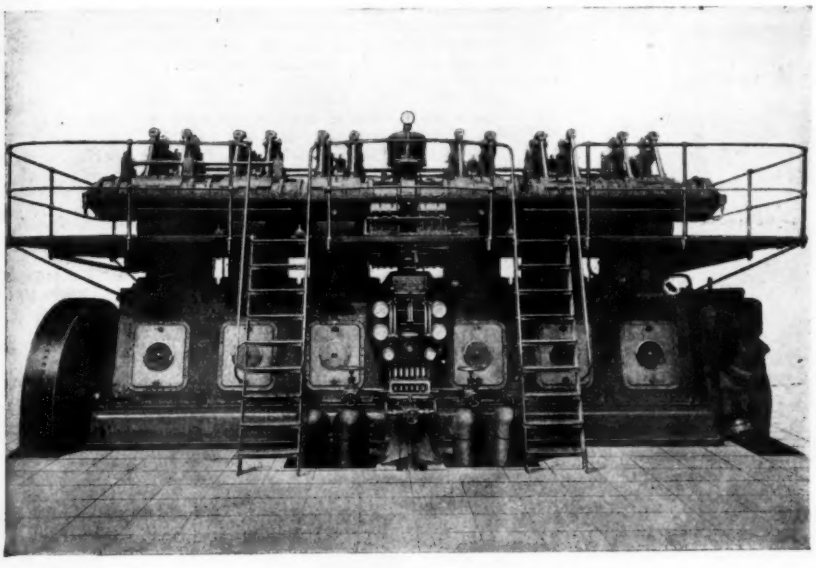


Fig. 1.—1,750-h.p. Diesel Engine.

6-cylinder engine of 1,750 b.h.p., 300 r.p.m., capable of dealing with 10 per cent. overload. It is coupled direct to a 1,200-kW d.c. generator. Both the engine and generator are products of the General Electric Co., Ltd., the Diesel being built at the Fraser & Chalmers Engineering Works, Erith, and the generator at the G.E.C. Witton Works.

Fig. 1 is a front view of the engine. It is interesting to note that it occupies only the same floor space as the 400-kW set which it has replaced, and that it is considerably less in height. It will be seen that the governors, fuel pumps and air bottles are all positioned at the centre of the engine, and the complete control is arranged from this point. The air compressor is of the 3-stage quadruplex type, mounted on the end of the main shaft, and was supplied by Messrs. Reavell and Co., Ltd.

The 4-stroke cycle is employed, the valves being operated by the usual horizontal cam-shaft method. It is interesting to note that this shaft is completely enclosed, inspection doors being provided at the cam points. The exhaust, air and fuel valves are arranged vertically. Water cooling is employed for the cylinders, cylinder heads, and exhaust valves, and oil cooling for the pistons. Both the water and oil systems are arranged on the circulatory principle, suitable cooling and filtering apparatus for the fluids being installed external to the engine. Electric driving is employed for each system. All the outlet flows from the piston-cooling system are at the centre, together with a pyrometer for reading the exhaust-gas temperature. Should the oil pressure fall to a predetermined figure, an alarm is sounded, calling attention to the change on the lubricating and cooling supplies; if the correct conditions cannot be restored immediately, the load can be removed from the engine and the continued fall of pressure automatically shuts down the engine.

An interesting device is that which trips the fuel pumps on the discharge side in the event of the speed exceeding the normal by 10 per cent. This tripping by the emergency governor cuts off the fuel supply to all the cylinders and the engine returns to normal speed without being shut down.

The engine is distinct inasmuch as aluminium-alloy pistons, 21.5 in. in diameter, are used, running in toughened and hard-steel cylinder liners. The economies effected by this bring about, it is claimed, a low fuel consumption and less friction and maintenance, and remove the danger and expense of seizure should the lubricating-oil supply fail. In so large an engine, probably always on heavy duty, this feature is most valuable, for the metals cannot fuse or weld together as the result of sudden excessive heat. Special attention has been given to the crankshaft, each of the six cranks being forged to its definite angle. The cylinder heads are of steel.

The steel cylinder liners are sufficiently thin to permit quick heat transfer to the cooling water without introducing any heat stresses such as would be obtained with thick cast-iron. The lubrication of the liner is carried out from six points, the oil being introduced by separate pressure feed pumps independent of the main supply.

The fuel consumption guaranteed is 0.39 lb. per b.h.p.-hour, and the lubricating-oil consumption 0.005 lb. The thermal efficiency is claimed to be 46 per cent. on the i.h.p. basis. With fuel at £4 a ton and a load factor of 70 per cent., it is possible, it is claimed, to generate electricity at just under a halfpenny per kWh, including lubricating oil, wages, and repairs.

The generator, fig. 2, is a shunt-wound machine supplying power at 180-220 volts and running at 300 r.p.m. It is designed on liberal lines throughout, both mechanically and electrically, and, moreover, it complies, it is claimed, in every respect with British Standard Specification No. 169/1925. Special attention has been given to the insulation. The generator is controlled by a G.E.C. switchboard panel of the flat-back type usually employed for l.p. supply.

At a celebration luncheon which followed the ceremony, Sir Hugo Hirst, chairman, G.E.C., pointed out that there was still a field for the Diesel engine. Electrical engineers were too often hampered by clauses in specifications, but in this case his concern had simply been asked to produce something that was wanted.

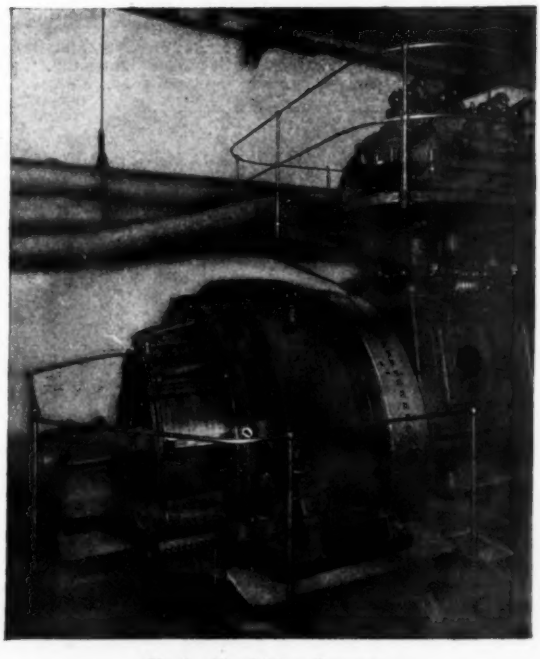


Fig. 2.—Diesel-driven Generator.

In advocating the retention in this country of the Diesel-engine stations for dealing with peak loads, Mr. A. H. DYKES pointed out that at the present time two 8,000-kW sets were being installed in Berlin for peak-load work.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

A Combined Switch-fuse.

A recent introduction of Messrs. S. Bill & Co., Limited, Queens Road, Aston, Birmingham, is a combined 2-way fuse-board and main switch designed for use in small house-lighting installations. Fig. 1 shows a 15-A main switch with two d.p. 8-A fuseways, but the apparatus is also made in combinations of: 30-A switch with 15-A fuseways; 40-A switch with 20-A fuseways; and 60-A switch with 30-A fuseways.

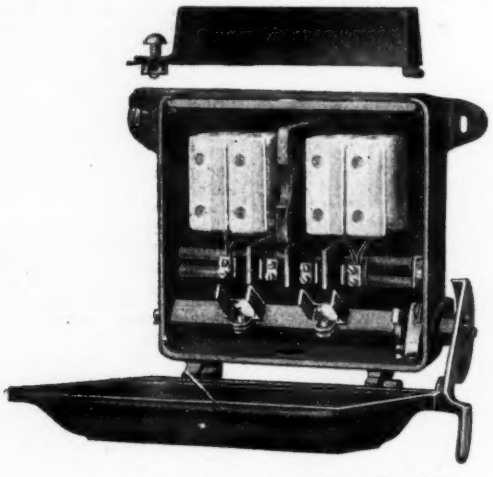


Fig. 1.—Combined Switch and 2-way Fuse Unit.

The switch is equipped with malleable-iron parts, and has a patent quick-make and-break action. The switch handle is also of malleable-iron, while bakelite insulation is used throughout. A feature is the absence of china in the switch movement for the sizes over 30 A. The contact clips are of phosphor-bronze and the brushes of copper. Detachable bakelite end plates, interchangeable with conduit boxes, are fitted. The general design is claimed to afford simple and clean wiring.

An Artificial Sunlight Lamp.

The accompanying illustration, fig. 2, shows a recent introduction of Messrs. Brodie, Oakley & Co., 94, Gray's Inn Road, London, W.C.1, the "Artsun" artificial sunlight lamp. It is a neat and light model specially designed for home use. It

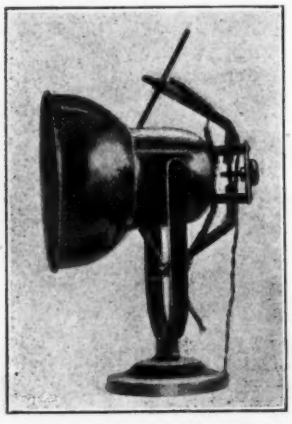


Fig. 2.—The "Artsun" Lamp.

can be used on a.c. or d.c. circuits, and is claimed to have a low current consumption (5 A) and to give a rich ultra-violet output; tungsten-cored carbons are used. A special feature is the provision of a heating resistance behind the arc, so that infra-red rays are projected to aid the penetration of the ultra-violet rays.

A Combined Switch-Relay.

The "Parmotor" relay," a production of Messrs. Parmotor Relay Co., 11, Blackfriars Street, Manchester, is claimed to be a new departure in such apparatus, it being designed to operate a switch which is embodied in the relay and capable of controlling a current of 15 A at 200-250 volts. The relay may be operated by any means that will provide a movement of 3/1,000 in. between the contacts of the operating devices, which may be, for instance, thermostats, hygroscopes, moving diaphragms operated by fluid pressure, and so on. The apparatus is claimed to be absolutely safe and certain in action and indestructible unless improperly used. The current consumption is only about 0.2 A at 250 V for approximately 1/30 of a second, *i.e.*, for the period that movement is actually taking place. No sparking whatever occurs at the contacts of the operating device, as the circuit is only *made* at the thermostat; it is *broken* in the relay itself; the "break" is ample and provided with a magnetic blow-out. Since the movement necessary to operate the relay is only of the order of .003 in., when used in conjunction with quite ordinary forms of thermostats, for example, it is possible, it is claimed, to obtain by simple screw adjustment a very high degree of accuracy; this applies equally to other methods of operation.

Street-lighting Fittings.

Messrs. Philips Lamps, Ltd., 145, Charing Cross Road, W.C.2, have produced a range of reflector fittings specially designed for use in conjunction with their "Argenta" opal lamp. Included in the range are types A.K. and A.G., fig. 3; these are manufactured of black enamelled sheet-

Fig. 3.—A.K. or A.G. Fitting.

Fig. 4.—N.D. Fitting.

iron and are provided with a white enamelled reflector which can be used convex or concave. By means of a set-screw the lamp can be adjusted to the right position. The A.K. fitting is suitable for 60- to 200-W lamps, and the A.G. fitting for 300- to 500-W lamps. A feature of these fittings is that no outside globe is necessary. In fittings N.R. and N.D. no separate white reflector is necessary, as the inner surface is coated with white enamel. The N.R. type is recommended where wide distribution of light is required, and is claimed to be particularly suitable for colliery work. The N.D. fitting, fig. 4, is designed as a deep-reflector unit for use where a concentrated light is desired. Type N.R. is made in four models for lamps of up to 500-W capacity.

A Sandwich Toaster.

A novel appliance recently marketed by the General Electric Co., Ltd., Magnet House, Kingsway, W.C.2, is the "Magnet" sandwich toaster which has been designed in co-operation with the catering trade on account of the increasing demand for the American toasted sandwiches. This apparatus consists of a hotplate fitted in the top of a warming cupboard; adjoining the hotplate is fitted a dish for melted butter. Sandwiches containing meat, cheese, and so on, are served on one side with melted butter by means of a small confectionery brush, provided with the apparatus, and are then placed on the hotplate, with the buttered side down, and pressed for a few seconds with the wooden press supplied. The other side is then buttered and treated in a similar manner, the result being a crisp, hot sandwich. The heat from the plate keeps the butter in the dish in a melted state, and also serves to heat the plate-warming chamber. The apparatus measures 24 in. by 18 in. by 8½ in. high, and is finished in dull nickel with its raised parts bright nickel plated. The area of the toasting plate is sufficient to accommodate at one time four large sandwiches. The loading of the toaster is 1,500 watts max., and three-heat control is provided.

Reflections from Ireland.

The author briefly reviews the natural power resources of the Irish Free State, contending that rural electrification will facilitate the revival of village industries, which will lead to industrial and social regeneration.

By LAURENCE J. KETTLE, M.Inst.C.E., M.I.Mech.E., M.I.E.E.

(*Abstract of Chairman's address before the* IRISH CENTRE *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

THE fact that I am commencing a second year of office places me in a somewhat embarrassing position: last year I reviewed the electricity position in Ireland and ventured to put forward some views on the future, but since the Free State passed the Electricity (Supply) Act, 1927, it is no longer possible for anyone in the electrical industry in this country to proclaim that "I am the master of my fate, I am the captain of my soul," for an Electricity Supply Board has been appointed, armed with practically absolute power. One of its functions will be the investigation of the natural power resources of the Free State, and it is to be hoped that the apparently more immediate objective of making electricity available to everyone in a commercial and economic way will not cause it to lose sight of this extremely important investigation work. Towards the end of the European war some effort was made in this direction by the British Government: three Board of Trade Committees reported on peat, water-power, and coal in Ireland and, in addition, the Commission of Inquiry into the Resources and Industries of Ireland also published valuable reports, and it would be most unfortunate if this important investigation work were not followed up.

Peat Deposits.

Peat is our greatest potential power asset. Heretofore its utilisation has not been found possible, but the British Research Board was prepared to devote £100,000 to a peat experimental station, and the Irish Commission recommended the starting of a 20,000-kilowatt peat power station, so that the Irish Board should at least find this field worthy of full and careful investigation. The fact that a great deal of tedious and time-consuming work will need to be done would seem to afford the reason for commencing the work, rather than for postponing it. Outstanding and striking are the facts that at least six million tons of air-dried peat are at present dug out and used as fuel in Ireland per annum, equivalent of about three million tons of ordinary coal; in other words, equal to the whole of the coal imported into the Free State. With a little State assistance and encouragement the output could be materially increased, and an increase of even 10 per cent. would be the equivalent of all the River Shannon's power in its first partial development. Peat power stations may not be a negligible proposition, even at present, if one may judge from the fact that a member of this Institution with very considerable experience of peat power production was able, a few years ago, to secure financial backing for a station near Dublin, which it was estimated could generate power for nothing, the chemical by-products paying all the costs.

Coal Resources.

Opinions vary considerably as to Ireland's coal-production possibilities, but the fact that the Castlecomer mines have been turning out some 60,000 tons of coal per annum, and have been working steadily for some 300 years, would indicate that the subject is at least worth investigating. There might very conceivably be prospects of a steam station burning powdered anthracite and supplying energy into the national network.

Water Power.

No full, or comprehensive, detailed survey has yet been made of the country's water-power. It should be undertaken at the earliest moment, for it will take years to complete. Irish water-power available has been estimated at almost half a million continuous horse-power, equivalent to some seven million tons of coal per annum.

Electricity and Gas.

In those towns which have a good gas service the domestic electrification problem is perhaps the outstanding one, and it is interesting to note how electricity and gas undertakings are interlinked in some countries, notably in the United States of America, in many cases the same man being at the head of both the gas and electricity industries in the same district. The opinion seems to be fairly widespread in the U.S.A. that gas need no longer be considered as an illuminant, that electricity will also take and keep the power field, but that for cooking and domestic and industrial heating gas will hold the field against electricity. I agree with these opinions, except with regard to cookery and domestic heating.

The mere fact that one London company, the Gas Light and Coke Co., sells more gas than the equivalent of all the electricity sold in Great Britain is sufficiently eloquent, but the contention that the coming of an electricity supply into any centre has never interfered with the gas undertaking must be accepted only with many reservations. So long as the population is increasing, or new uses are being found for gas and electricity, there is no reason why both businesses should not develop, and the competitive factor undoubtedly stimulates both, but it may be quite frankly admitted that, up to the present, electricity has made no great inroads into the cooking business of any of the really active gas concerns. In Great Britain the percentage of the gas output used for domestic purposes is at least 80 per cent. and in the United States it is estimated that 72 per cent. of the gas output is used for domestic purposes and about 20 per cent. for industrial heating. The magnitude of the gas industry may be gauged by the fact that in Great Britain the gas undertakings sell a quantity of gas which corresponds in heating value to about 39,000,000,000 kWh of electricity, or about seven times the value of the electricity sold for purposes other than traction and special process work. It is true that the thermal efficiency of electricity is substantially greater than that of gas, but even allowing for this the gas industry is well ahead.

In Ireland the gas output corresponds to over 1,000,000,000 kWh of electricity, of which about 400,000,000 kWh is produced in the Free State, or, say, seven times as much as the electricity output. The Free State does not compare unfavourably with Great Britain or with Northern Ireland in the matter of electricity *versus* gas, notwithstanding the heavy handicap due to the absence from the Free State of great industrial works, which are always the main users of electricity. Of the 8,500,000 gas consumers in 1925 in Great Britain 4,600,000 had slot-meters, and the gas industry depends almost entirely upon cooking, one of its principal assets being the slot-meter. If electricity is to secure its place in the kitchens of the country, the main requirements are a slot-meter and a simplified tariff. Until quite recently electricity meter manufacturers had devoted little attention to the large slot-meter, such as is required for cooking installations. The psychology of the average housewife and her attitude towards slot-meters is rather interesting; she is in general quite prepared to pay a great deal more per annum through a slot-meter than in the form of quarterly bills, for the gradual contributions necessitated by the slot-meter create no great domestic embarrassment. Whilst we are attempting to achieve the simplicity of the gas tariff, the gas industry in America is attempting to emulate the scientific tariffs of electricity suppliers, and states that scientific tariffs are one of the great assets of the electricity industry.

Rural Electrification.

Although very considerable agricultural electrification has taken place in several countries, the general progress is somewhat disappointing, as only 5 per cent. of the farms have been electrified, even in an electrical country like the United States; this percentage also holds good for Europe.

Our new Electricity Board might consider making an arrangement with the Department of Agriculture regarding its model farm in the immediate neighbourhood of Dublin for completely equipping it with all sorts of electrically-driven labour-saving machinery, so that it could be used as a demonstration and training centre for the propagandists who will be necessary for the electrification of the country.

An aspect of rural electrification which must not be overlooked is the starting of village industries. The world was, from very many points of view, a much happier and more satisfactory place to live in before the coming of steam power and machinery, with its accompaniment of centralised production and capitalists and communists. There was a much greater measure of general prosperity in the old days of the village industry, before engineers started to disturb the world: the manufacturer was then himself a worker, and the workers were not mere cogs in the innumerable wheels of a devastating, soulless, machine; every district and every country was practically self-supporting.

The governing factor in modern industrialism is the fact that the machinery of distribution and selling has become so exceedingly complicated that the actual production costs have assumed a secondary importance: between the manufacturer and the consumer there is interposed a vast army of transporters, wholesalers, selling agents, lawyers, artists, paper and ink makers, literature distributors, bill posters, and retailers. The whole commercial structure begins to topple by reason of its own sheer height and magnificence; the parasites, pedlars, and profiteers have proved to be too great a superstruc-

ture for the foundation. The handlers and the middlemen are the only classes which seem to be fairly comfortable, the very classes, in fact, that are doing the least from a constructive point of view.

Social Regeneration.

What is the cure for this extraordinary state of affairs? It is the elimination of the parasites, pedlars, and profiteers by a return to the old village industry system, which will immediately simplify the selling process so far as the real necessities of life are concerned, because the producer will then consume what he produces without having to pay for sending it half-way round the world in order to provide profits for a multitude of people who produce nothing.

There is no doubt whatever about the ability of the modern village industry to compete with the product of the big factory in the supply of everything necessary to sustain life, even if we were to return to the primitive production system of our great-grandfathers; the only need is for leaders to show the way, for the community to break away from the thraldom of habit. The wheel has turned a full circle, but the old primitive system will be remodelled with the assistance of the engineer, and the all-powerful agent in this industrial and social regeneration will be electricity.

On close examination this may seem less Utopian than it appears at first sight, for the conditions in the country are such that one cannot view them without a considerable amount of misgiving and alarm. It is probably true that only exceedingly hard times can effect the change suggested, but hard times are inevitably coming, and communism in the electrified form will certainly be more desirable than communism in the Russian form.

The Attenuation of Wireless Waves.

The results of an investigation carried out by the Radio Research Board indicate the material influence of the energy-absorbing properties of tree-covered areas.

By R. H. BARFIELD, M.Sc., A.M.I.E.E.

(*Abstract of Paper read before the* WIRELESS SECTION *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

IN their 1926 paper, Dr. R. L. Smith-Rose and the author discussed the then existing knowledge, both theoretical and experimental, on the subject of the attenuation of radio waves over the earth's surface. They concluded that further experimental work was desirable, and, accordingly, the investigation referred to hereunder was undertaken. It had to do only with the "ground ray" over land; waves which travel *via* the upper atmosphere will be affected by the earth's surface in a different way and to a much less extent, their case being therefore excluded from the present discussion.

With the aid of portable apparatus the intensity of the signals from the London broadcasting station (2 LO; λ=364 m.) was measured along a number of radial lines in seven different directions up to a maximum distance of 100 miles to enable curves to be drawn of the overall attenuation and derived curves showing only the surface absorption effect; the experimental results were then compared with curves drawn in accordance with Sommerfeld's theory of attenuation. The results show that the attenuation is not the same in all directions, the difference being quite important, and comparison with theory shows for all directions considerably greater attenuation than would be expected from the previously determined value of the earth's conductivity. It is suggested that both these features of the results can be explained as an effect due largely to the well-wooded nature of the English countryside; an experimental method was developed by which the energy-absorbing property of individual trees can be directly measured, and the results obtained enabled the total energy-absorbing properties of a given tree-covered area to be calculated, thus providing a correction for trees which can be introduced into the theoretical formula.

Curves obtained by plotting the absolute value of the signal strength measured in millivolts per metre against the distance in kilometres for each of the seven experimental runs enabled a contour map to be constructed (fig. 1); survey made during May to October, 1926, in the radial directions indicated by the arrows; approx. 16 amps. aerial current; approx. 30 m. effective aerial height. In order, however, to get the information for which the whole investigation was planned, *i.e.*, the attenuating effect of the earth's surface, it is necessary to separate this effect from the normal attenuation due to the spreading out of the waves: since the latter effect causes a diminution of field intensity according to an inverse-distance law, the separation can be easily effected by deriving a series of curves in which the product of field strength and distance is plotted against distance, which is the accepted method of treating the problem. The shape of the experimental curves agrees well with that of the theoretical curves and, to that extent, confirms the theory, but two facts must be reconciled with it, namely, (i) the variation of attenuation with direction and (ii) the fact that in all directions attenuation is greater than theory predicts. When it is remembered that the value taken for the earth's conductivity (σ=2.5) is only a rough mean between widely different values found experimentally, it may at first be thought that the discrepancy can be explained away as due partly to an inaccurate knowledge of this constant and partly to its variation from place to place. This explanation, however, is unlikely to be correct, first, because the evidence of the experiments by which σ was originally obtained is against any *regional* difference in σ such as would explain the variation of attenuation with direction, and, secondly, because all the apparent conductivities are well *below* the mean theoretical value, whereas one would expect some to be greater and some less if this explanation were correct.

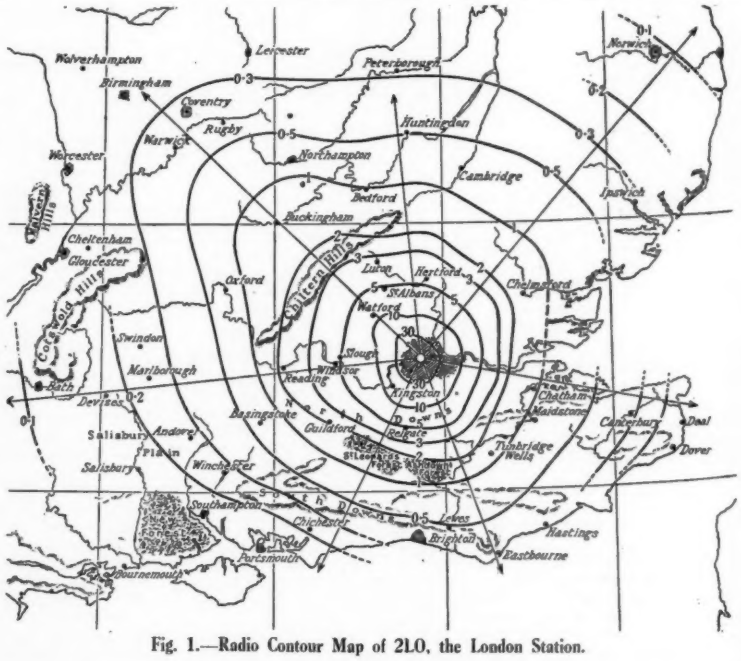


Fig. 1.—Radio Contour Map of 2LO, the London Station.

An alternative explanation which is more satisfactory is that the theory does not fit the facts because it assumes a flat surface and does not take account of objects, such as trees, houses and other erections which occur in practice. With a few exceptions, almost all parts of the English countryside are thickly wooded and the presence of an obstacle in the path of a wave causes local distortion of the electromagnetic field in its neighbourhood; that is, the induction field of a tree is superimposed on the normal field of the wave, the resultant field distortion resembling closely that which occurs in the neighbourhood of a wire carrying a current

in a uniform magnetic field. If measurements of the resultant field direction be made at various points round the tree by means of a portable direction-finder, the resultant field can be mapped out and the amount of field distortion produced by the tree thus definitely measured. For instance, it was found that a thin tree 75 ft. high distorted the field 5 deg. 5 ft. away from its trunk, and a large tree 85 ft. high caused 10 deg. distortion 10 ft. from its trunk; about 1,600 trees per km² will have an attenuating effect equal to that of the earth for the particular experimental conditions given. Since the above hypothesis was put forward, estimates have been made of the density of trees in the various parts of the region surveyed, and actual counts have shown that the number varies from orders of 500 per km² in the least-wooded districts (region north of London) to 4,000 per km² in the most densely wooded parts (region south of London).

The conclusion arrived at is that the greater part of the discrepancy between Sommerfeld's theory and experiment can be ascribed to the effect of trees, and also that the same agency offers a satisfactory explanation of the difference of attenuation observed in different directions—the greatest attenuation corresponding to the most-wooded regions, and *vice-versa*.

The experimental results show no evidence of any screening, or other effect, due to hill systems encountered in the region investigated, which included the North and South Downs and the Chiltern and Cotswold ranges.

Finally, check-measurements of attenuation on two other wave-lengths gave results satisfactorily confirming the conclusion derived from the main experiments.

Reviews.

Data for Engineering Inquiries. By J. C. CONNAN, O.B.E., B.Sc., A.M.I.E.E. Pp. xv+324. London: Sir Isaac Pitman and Sons, Ltd. Price 12s. 6d. net.

Many books have been written with the object of saving valuable time in the Estimating Office, but very few have been compiled with the thoroughness and careful forethought which have been bestowed upon the collection of material comprising this volume.

Electricity is making so rapid an advance in every section of engineering that it is almost impossible for even the most competent engineer to be fully conversant with every class of apparatus with which he comes into contact. He may have a perfectly sound knowledge of the general principles governing the working of a plant without having a correspondingly clear knowledge of the technical details thereof. The aim of the author of this volume has been to place the estimating requirements necessary for a very wide range of engineering plant in a convenient and easily accessible form.

Those engaged in the sending or receiving of estimates are nowadays quite familiar with the "questionnaire" type of inquiry form, which consists of a list of questions submitted by a manufacturer to his client, from the answers to which it is possible to quote for a suitable plant without loss of time. Mr. Connan has not only collected over two hundred such forms, but, in addition, has added in connection with each suitable paragraphs enlarging upon the type of answers required.

The book is divided into three sections. The first is devoted to the general outline of the most usual type of inquiry, the questions given covering such particulars as specifications, deliveries, erection, supervision, terms of payment, drawings, &c., and these, when read in conjunction with the footnotes, form an admirable basis for the preparation of an inquiry for almost any size of plant. The second section deals with the data to be supplied with the estimate. This is perhaps the most important detail to be considered when estimating, for it is surprising the number of estimates which are received minus vital information regarding the plant offered, particularly when plant has to be sent abroad. Questions are included which ask for overload, capacity, efficiency, cyclic irregularity, horse-power required by machinery, form of drive, accessories necessary, but not included, Customs duties, &c. When there is more than one method for the estimator to supply the information the footnotes clearly indicate the one required according to the class of machine being offered.

In the third and main section (the two sections above-mentioned occupying only about eight pages of the book) will be found the collection of data forms. These are grouped together in alphabetical order, and deal with the majority of machines and accessories in general use in engineering to-day. It would occupy too much space to give a list of these, but whether it be only a simple carbon brush which is required, or a main generator with boilers, turbine and all auxiliary machinery, including cooling towers and foundations, it is possible to build up the necessary inquiry from the forms included in this section. Other forms given deal with gas engines, passenger lifts, elevators, bridges, switchboards, fans and a complete factory specification.

From this it will be seen how thoroughly the author has attacked the problem, and it would be difficult to name a piece of engineering plant that could not be clearly and concisely inquired for after perusing the specimen questions given concerning either the particular plant required or a similar piece of apparatus. In this respect mention should be made of the index, which has been compiled with care, the generally accepted description of a plant or piece of machinery being given and, in addition, where different terms are used by various sections of engineers, both terms have been included, a cross reference being used in order to save the time of the reader.

The book will probably appeal strongly to many consulting engineers and estimators engaged in engineering generally and contract work.

To those who have to prepare specifications it will help a great deal in the initial stages and form a good basis upon which to work, saving frequently the process of drafting headings upon which to build the various sections and clauses.

Mr. Connan has in this volume done something to assist the estimating department, and it is very doubtful whether it could have been done in any other way than upon the excellent lines which he has chosen.

The Magneto Manual. By H. R. LANGMAN. Pp. x+221; figs. 86. London: Crosby, Lockwood & Son. Price 7s. 6d. net.

As instructor and lecturer in magnetos at the R.A.F. No. 1 School of Technical Training at Halton, Bucks., and sometime lecturer in motor engineering at Devonport and Plymouth technical institutions, the author is well qualified to write, as he has done, a practical and general reference book for automobile engineers, aeronautical engineers, mechanics, apprentices, chauffeurs, car owners, &c. The work, which forms one of the series of Lockwood's Manuals, consequently treats the subject more deeply and thoroughly than is the case with books mainly intended for novices, and is one that may be recommended to the principals of polytechnics and technical institutes where classes in motor engineering are held.

In New Zealand much more has been done in the training of efficient motor-repairing mechanics than in this country. There are, however, indications of a wakening up to the need for such instruction in Great Britain, where the maintenance of motor vehicles, having regard to the large number now on the road, is becoming quite as important, if, indeed, not more so, than the motor vehicle building industry itself. It is in this connection that Mr. Langman's work will prove of great service, inasmuch as it is largely in respect of the details of the electrical equipment of cars that motor mechanics are chiefly lacking in technical knowledge.

After dealing briefly with preliminary considerations of the ignition problem, the author discusses the principles involved in the various forms of high-tension magneto now in use, such as the rotary armature, sleeve and polar inductor types, and proceeds to explain the construction of the principal components of magnetos and the latest improvements in such machines. Separate chapters, all well illustrated, are devoted to "Arrangements for Maintenance of Constant Spark Intensity," "Magneto Adjustments," and the "Timing and Setting of Magnetos." In the latter is given a useful table of the firing order of engines with from four to sixteen cylinders. Curiously enough, however, no reference is made in the table to eight-cylinder engines, either of the Vee or "straight eight" type, and we would suggest that in any subsequent edition of the work the firing order for these types should be given, especially in view of the large number of different makes of cars with "straight-eight" engines which are now being produced both in Europe and in America.

A final chapter is devoted to an interesting dissertation on the phenomena of electromagnetic induction, while a somewhat novel and exceedingly useful feature—useful both for the teachers of classes in electrical matters for automobile and aeronautical mechanics and for the man who is determined to improve his knowledge by studying alone in his spare time—is the four and a-half pages devoted to a series of fifty-six questions which the student should be able to answer properly if he has fully digested the course of instruction Mr. Langman's work provides.

Properties and Testing of Magnetic Materials. By THOMAS SPOONER. Pp. xiv+385; figs. 223. London: McGraw-Hill Publishing Co., Ltd. Price 25s. net.

The author, in the preface to this book, states that the purpose for which it has been written has been, first, to give a reasonable account of present-day knowledge of the properties of commercial magnetic materials, and, secondly, to describe the various methods of testing suitable both for the examination of such materials, and also for research investigations. Few people are more fitted to deal with the subject of applied magnetism on these lines than Mr. Spooner, and we may say at once that he has done his work thoroughly and well, and has written a book which will not only be invaluable to the senior student, and to those professionally concerned with magnetic investigations, but will also be an important addition to the reference library of any electrical engineer.

After a brief recapitulation of the elementary theory of the magnetic circuit, the author proceeds to deal with the general characteristics of magnetisation curves, the effect of alternating current on direct-current magnetising charac-

teristics, and the nature of hysteresis and core loss. The characteristics of permeability and core loss are examined in greater detail in a useful chapter, in which the properties of a large number of magnetic alloys are considered, and a mass of numerical data is given in graphical form. A considerable amount of information is given in this chapter, relating to the properties of nickel iron alloys. Further valuable chapters deal with the properties of permanent-magnet steels, and the effect of frequency on apparent permeability and core loss values. Much useful data is given on the effect of mechanical stress on magnetic properties, and on the effect of heat treatment. In the chapter on reversible temperature effects, the importance of the temperature co-efficient of the permanent magnets used for electrical instruments is emphasised. This temperature co-efficient is stated to vary widely with the composition of the magnet steel, and also with the heat treatment, and for measurements in which the highest accuracy is required, temperature control offers the best means of attaining this end.

The second part of the book is devoted to the subject of magnetic testing. The author rightly stresses the value of routine magnetic tests, and points out that they give the manufacturer a means of readily checking the uniformity of the manufacturing processes, heat treatment, and chemical composition. From the point of view of the customer such tests are invaluable in that they enable him to purchase to definite specifications, and also to grade his stock of material so that it can be used to the best advantage. The value of magnetic testing also tends to extend in view of the growing knowledge of the relationship between magnetic and other physical properties of materials. The subject of magnetic testing is dealt with by the author in a comprehensive and authoritative manner. Grouping the various methods under the two heads of a.c. and d.c. tests, he deals first with the general principles of these two classes of tests, and then with the practical applications of these principles. The various commercial instruments for magnetic testing are described in detail, whilst the chapter on d.c. test details is one of peculiar utility, being replete with information of a practical character regarding the precautions to be taken in magnetic testing, and the choice of the most suitable methods for various circumstances. This section of the book will be of the greatest assistance to those engaged in experimental work in this field, and itself constitutes a valuable work of reference on the subject of magnetic testing.

In the final section of his book, Mr. Spooner deals critically with the core losses in transformers and rotating machinery, and devotes a chapter to the interesting subject of magnetic analysis. The examination of the physical properties of materials by magnetic testing is a process still in the early stages of development, but one which is of considerable promise. An interesting application of this method of examination described by the author is one in which the specimen to be examined is immersed in an oil bath containing minute iron particles in suspension. For soft specimens the magnetising force is applied whilst these are in the bath, but hard specimens can be magnetised before immersion. The presence of cracks and flaws is indicated by the collection of iron particles at the defective spot. It is stated that cracks almost invisible to the naked eye can readily be detected by this method. The method of measuring the local permeability of large specimens has been successfully applied to such parts as turbine rotor disks, rifle barrel stock, and helical springs, flaws being indicated by an abrupt variation in local permeability.

The book is provided with an index, and with a list of symbols. The lists of references to original papers given at the end of each chapter will be of considerable assistance to those desiring to pursue their studies in the subject of applied magnetism.

Electrical Engineering.

Retrospect, introspect and prospect: the vital importance of permitting only first-class installation work to be carried out.

By J. EDWIN STORR, M.I.Mech.E., M.I.E.E.

(*Extracts from Chairman's Address before the* NORTH-MIDLAND CENTRE *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

RETROSPECTION can illumine the existing position, assist in the better understanding of the present, and lead future development. The British output of electrical plant at the present time is valued at about 85 million pounds per annum. which is approximately 65 per cent. of the output of Germany, compared with 50 per cent. of the same country's output two years ago. The salient developments of electrical science are unparalleled in any other field of activity, but what of the prospect of the future?

It is of primary importance that the electrification of our industries should be accelerated. Our competitors lead in output and effective competition mostly in basic industries, wherein they have improved their equipment and electrified their mines, steel works, and textile mills.

Very frequently electricity tariffs are expected to wholly modify cost of production, but how impossible, when power costs are often not more than 2 per cent. of the cost of production, compared with labour at 60 per cent.! "Labour-saving equipment electrically operated" should be the manufacturers' slogan. Women are awakening to the possibilities of a new domestic era, which will have to be met by the engineer, or the probability is that they will do it themselves. It is to the credit of the electricity supply sections of the industry that, whereas the cost of the majority of items making up the country's expenditure are still away up above pre-war prices, the cost of electricity is rapidly approaching the 1914 level, and it is suggested that greater publicity in announcing reductions will show to the country at large what electricity is doing to assist industry to meet competition.

Contemplation of future work must include the part to be played by installation engineers and wiring contractors. The responsibilities attached to this section of electrical work are enormous, often of vital importance, and not hitherto appreciated as they should have been. It must be realised that it is useless to make available a "cheap and abundant" supply of electricity unless it can be used with safety to life and property. There are a great number of reputable firms and workmen capable of executing thoroughly satisfactory installations for industrial or domestic requirements, but, unfortunately, a class of contractor and workman has gained an entry into the industry whose only intention appears to be to make a complete circuit, "to get the current through," and secure payment, leaving the remainder to the inevitable. Exceptionally low-priced tenders are coincident with shoddy work and inferior accessories. Some of the unsatisfactory work which has been executed at normal rates can only be classed as "robbery," and in the best interests of the industry this class of work must be exposed and speedily eliminated.

It is not suggested that wiring work should be made expensive; the cost of installation work is as important as generation, or other, costs, but it should be realised that new conditions are arising in installation work; wiring to cooking, hot-water, and other heavy-current apparatus, often situated where earth conditions are most definite, demands only first-class material and, what is more important still, A1 workmanship. There are in existence organisations for securing first-class installation work, but they are persuasive only, and only a proportion of the contractors are associated with such movements. The nature of installation work is such that it must be out of sight, and such conditions favour hiding away unsatisfactory work; the insulation test only is no criterion of first-class work, and cannot take the place of adequate inspection and the enforcement of a minimum standard of good work.

Electrical installation work, contrary to other phases of electrical work, is not being done better than in the past, but in many cases the standard of excellence has depreciated to an alarming extent. Unless the problem is dealt with promptly and in a very effective manner, it can only end in such a set-back to development work in the industry as a whole, and domestic work in particular, as will be regretted by everyone in the industry. Installation work is of such importance as to demand serious and definite steps being taken to eliminate all contractors and workmen who cannot satisfy a reasonably high degree of efficiency. Generally speaking, it is not recognised that good installation work is the problem of the whole industry; neither the power supply authority, the manufacturer, nor the consumer, can afford to neglect this important work, or say "It is not my responsibility."

All opportunities bring parallel responsibilities, and to be really successful the engineer must not only be a qualified engineer, but a true man, careful of the responsibilities he is called upon to shoulder, loyal to his employer, and capable of cultivating the ability to work in harmony with his fellows.

Metallurgy in Electrical Engineering.

Some Observations on Recent Researches.

"SOME Metallurgical Problems of the Electrical Industry" was the title of an address given by Mr. C. C. Paterson, O.B.E., director of the Wembley research laboratories of the General Electric Co., Ltd., before the London Section of the Institute of Metals.

Speaking on the question of conductors, the lecturer remarked that one of the heaviest items of expenditure in the electrical industry, and one which reflected itself directly in the cost of energy to the consumer, was the capital expenditure on transmission. In the case of underground cables the copper might be taken as presenting, for h.p. work, some 20 per cent. of the cost, and for l.p. work about 50 per cent. For long-distance overhead transmission the cost of the copper was of the order of 45 per cent.; the remaining cost being the supporting towers, with their insulators, the spacing of which depended upon the tensile strength of the conductor.

A further complication occurred in the more important schemes of h.p. overhead transmission, owing to the fact that the diameter of the conductor must be kept over a certain minimum, as otherwise large power losses would occur through "corona" discharge, and much ingenuity was being expended in the development of tubular conductors. It was safe to say that these would present metallurgical problems.

"Are we wedded indefinitely to copper or aluminium as we know them to-day, or may we contemplate the possibility of a copper with the same conductivity and higher tensile strength—or is it beyond the bounds of possibility that metallurgical research will yield a high-conductivity alloy to rival copper?" The author did not believe that the possibilities of the lighter metals, beryllium, lithium boron, aluminium, when alloyed, had yet been fully investigated.

The electrical industry made use of several different magnetic properties and the problem of improving materials magnetically was more complicated than that of improving their conductivity. With regard to the composition of magnetic materials, the influence of impurities loomed very large. In particular, the reseaches on the effect of carbon in iron had shown the former element to possess an enormous and controlling effect on the permeability and hysterisis loss, so that by reducing the carbon percentage to 0.002, material of greatly increased permeability and greatly reduced losses could be produced; the method, of course, was that of vacuum melting. Nickel-iron alloys with about 75 to 80 per cent. nickel, by no means exactly pure, showed ten times the permeability and negligible losses as compared with the purest iron. The addition to these alloys of a few per cent. of tungsten or molybdenum apparently increased the permeability still more, and at the same time increased the electrical resistance. Such results lent a new significance to the discovery that the iron-cobalt alloy, with about 30 per cent. cobalt, had a 25 per cent. higher saturation value than iron. Could such a material be produced cheaply and with reasonable hysteresis loss and permeability, it would be of immense value in rotating machinery.

Generally speaking, mechanical work such as rolling or drawing was injurious to magnetic properties, while annealing improved them. It was probable, too, that crystal structure was of importance to magnetic quality, but so far experiments on single crystals were not easy to reconcile with one another, and the whole subject was in an elementary stage of investigation.

From the practical point of view, it was probable that heat-treatment and methods of manufacture adapted to reduce impurities were the main points wherein production lagged behind laboratory research and where, therefore, development was required.

Referring to the effects of impurities upon the properties of materials, the lecturer urged the importance of their investigation, even of the most minute traces, say, less than 0.01 per cent. The evolution and application of methods of detecting and eliminating the last traces of impurities in materials produced for study in the laboratory was likely to prove a most fruitful subject of research, and should have theoretical as well as practical interest. The spectroscope (visible, ultra-violet and X-ray) was, of course, an essential tool in such researches.

Touching upon the effects of foreign ingredients present as impurities, the author pointed out that the presence of gases in metals such as nickel, molybdenum, and tungsten had impressed itself in recent years on all those who had had to deal with high vacua in the manufacture of incandescent lamps and thermionic valves. For the satisfactory operation of those devices it was essential that no gas should be evolved within the glass envelope. In many cases the metal parts when in use were maintained at high temperatures—nickel anodes, for example, being used at 700 to 800 deg. C. Commercially pure metals were quite unsuitable for use as received, and a two-hour treatment in vacuo until the gas pressure fell to 0.004 m.m. of mercury was usually necessary to remove the bulk of the gases contained in the metal.

In considering the effect of gases on electrical properties of metals, we were chiefly concerned with gases present in solution or in the grain boundaries. The presence of blow holes or other unsoundness in metal affected the electrical conductivity in such an obvious manner that we might dismiss this class of gaseous impurity. Soluble impurities had a marked effect on the electrical conductivity and, for this reason, the presence of dissolved gases in metals was often more easily detected by changes in the electrical than in the mechanical properties. Comparatively few data were available, however, for the common metals, possibly because of the practical difficulties of removing gas on an industrial scale. The magnetic properties of metals appeared to be influenced by the presence of dissolved gases, although no quantitative data were available.

Non-metallic impurities affected the electrical properties of metals in a degree depending upon their distribution. They might be looked upon as non-conductors in comparison with the metals in which they occurred. The effect of non-metallic impurities on the magnetic properties of iron has been investigated, amongst others, by Yensen. Sulphur increased the hysteresis loss in pure iron, and in the 4 per cent. silicon-iron alloy, in proportion to its concentration, whilst the effect of phosphorus was more complex owing to its partial solubility.

Oxides and other non-metallic impurities all exerted injurious effects on the magnetic properties of iron, owing to the comparatively large volume which a small percentage by weight must occupy.

The presence of metallic impurities generally resulted in a decrease in the electrical conductivity of metals, although the magnitude of the effect varied considerably in different cases. The effect of arsenic on the conductivity of copper had recently been studied by Hanson and Marryat. Their results, as follows, were of considerable importance in view of the use of arsenic as a deoxidiser for copper: for 0.00, 0.053, 0.093, 0.36, 0.60, 0.86, and 1.04 per cent. of arsenic, the mass conductivities were 102.1, 85.5, 76.7, 44.9, 33.4, 25.7 and 22.1 respectively.

Arsenic was soluble to the extent of about 7 per cent. in copper, and as little as 5 parts in 10,000 reduced the conductivity by 15 per cent.

The temperature coefficient of resistance was of great practical importance in the case of alloys used for making standard resistances. To be satisfactory for this purpose magnanin should have a temperature coefficient of less than 1 by 10^{-5} microhm cm. per deg. C. This alloy had approximately the following composition:—Copper, 83.5 per cent.; manganese, 13 per cent.; nickel, 3 per cent.; and iron, 0.5 per cent. Variations in the proportions of the constituents affected both the resistivity and the temperature coefficient. The thermo-electric properties of alloys were also readily affected by the presence of soluble metallic impurities, and to avoid variations from batch to batch in manufacture careful control was necessary.

What the electrical industry wanted from the metallurgist was an alloy in the form of wire which would hold up indefinitely in service to higher temperatures than at present used, remembering that every 50 deg. C. was worth having. By "holding up" be meant that it must not develop local hot spots when heated by electric current, and that for certain uses it must remain stable, *i.e.*, be free from sag or creep, and it must also be producible at an economic price. It was most important to devise and to establish tests for the first two of these qualities, which would permit one alloy to be compared with another for the effectiveness in high temperature electric heaters.

In the G.E.C. laboratories they had been making a study of the subject and trying various tests, having regard also to proposals from other quarters, mainly America and Germany. Details of this work would shortly form the subject of a more formal publication by Dr. Smithells and Mr. Williams.

"La Playa."

During 1923 the *La Playa*, the first large Diesel-electric vessel to be built in this country, ran her trials; it was decided subsequently that her engines should be replaced by those of another design, and it was found that Fiat two-cycle engines were of suitable dimensions for the space at the disposal of the builders. The new installation has recently been completed in Italy; her owner is the United Fruit Co., Boston. The original machinery arrangements have been adhered to, inasmuch as there are four engines coupled to main and auxiliary generators, the auxiliary machines being used as exciters for the main dynamos and for the propelling motor aft. There are two armatures in series on a single propeller shaft. The four main generators are in series, so that multiples of 220 volts up to 880 volts are obtained. The machinery is of the latest specially balanced type, each engine having four main working cylinders with a bore and stroke of 500 mm.; the designed speed is 250 r.p.m. and the normal output of each unit 950 b.h.p., so that the aggregate power of the Diesel engines is 3,800 b.h.p.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

The Pacific Cable.

On December 5th, Mr. A. M. SAMUEL, Financial Secretary to the Treasury, informed Sir WALTER DE FRECE that the revenue of the Pacific Cable Board had undoubtedly suffered during the past year owing to the competition of the "beam" service and the lower rate charged. The Board was taking steps to effect economies in administrative expenditure, and experts were continuously engaged in improving the methods of working. The new cable was one of the most efficient in the world, having a capacity of about 1,200 letters a minute as against a maximum of about 260 on the old cable.

On December 5th, Mr. A. M. SAMUEL informed Mr. O. Nicholson that the duplication of the Pacific cable was carried out between 1923 and 1926 at a cost of £2,641,000, which was met out of reserve funds. The Board made a working profit of £178,284 during the year ended last March, and, after paying £77,545 for interest and repayment of capital, devoted £100,739 to its reserve and renewal fund.

Cost of the Rugby Station.

On December 5th, Sir W. MITCHELL-THOMSON informed Mr. O. Nicholson that the total capital cost up to March 31st last of the Rugby wireless station, including site, buildings and telegraph and telephone plant, was approximately £490,000. He estimated the present annual expenditure, including interest, depreciation and amortisation of capital, at about £123,000 and the annual revenue at about £57,000.

The South-Eastern Electricity Scheme.

On December 5th, Mr. O. NICHOLSON asked the Minister of Transport if he was aware that a large number of the electricity undertakers affected by the South-East England electricity scheme had represented to the Central Electricity Board that certain provisions of the scheme were *ultra vires;* and whether, in view of this, he would urge upon the Board the necessity of making some announcement as to the procedure proposed by the Board in respect of the scheme.

Col. ASHLEY said he was not aware of the details of the representations which had been made to the Central Electricity Board on the electricity scheme for South-East England prepared by the Electricity Commissioners; but he understood that the Board was considering the scheme and the representations in accordance with its statutory duty, and was at present engaged in discussing these representations individually with the undertakers.

On December 6th, Colonel BURTON asked the Minister of Transport whether his attention had been drawn to the map accompanying the South-East England Electricity Scheme; whether he could state at what points between Ipswich and the western border of Suffolk the projected grid line from Ipswich to Cambridge could be tapped; and what would be the approximate cost of supplying the towns of Sudbury, Hadleigh, and Haverhill from this source.

Colonel ASHLEY said that in the scheme no proposals were made for tapping the line between Ipswich and the western border of Suffolk. It was, however, open to the Central Electricity Board to arrange at a later date for tapping the grid if that should prove the most economical method of affording a supply to authorised undertakers.

On December 6th, Captain WALLACE asked the Minister of Transport if he was aware that the borough of Hornsey could generate electricity at a cost of ¼d. per kWh as against the proposed charge of .63d. per kWh under the South-East England scheme; and if he would undertake to hold a public inquiry before adopting a scheme which would increase the price to the consumer.

Colonel ASHLEY said that a station could not be compulsorily closed down unless the Central Electricity Board was in a position to supply at a cheaper rate. Parliament had placed on the Board the duty of investigating schemes submitted to it, and he understood that it was at present discussing in detail representations with the undertakers concerned.

Communication with the Falklands.

On December 5th, Viscount SANDON asked the Under Secretary for the Colonies what were the communications as to wireless, cable, and mails of the Falkland Islands; whether any steps were being taken towards their improvement; whether the installation of direct wireless communication with Great Britain or some part of the Empire could be undertaken; and what would the cost of this be.

Mr. ORMSBY-GORE said that there was no cable communication with the Falkland Islands. Mails were transmitted in either direction by vessels of the Pacific Steam Navigation Co. and such other opportunities as occurred from time to time. As regarded wireless communication, messages from the Government station at Stanley were relayed usually *via* the station at Cerritos in Uruguay. The Governor had recently submitted proposals for the establishment of a station capable of direct short-wave communication with the United Kingdom, at a cost which he estimated roughly at £3,000. Those proposals were being examined from the technical and the financial points of view.

Tenders for Telephone Cords.

On December 6th, Mr. BETHEL asked the Postmaster-General whether, in inviting tenders for telephone cords and flexible cables, the forms of tender invited information as to the source of origin of the goods and if they were wholly or partially of British manufacture; and, seeing that in one small centre of Lancashire the number of operatives engaged on the production of polished cotton yarn had decreased from 5,000 in 1919 to less than 500 in 1927, if he would consider the desirability of stipulating that materials supplied for use in the Post Office should be entirely of British manufacture.

Sir W. MITCHELL-THOMSON replied that tenderers for telephone cords and flexible cables, like all tenderers for articles supplied to the Post Office, were invited to state the origin of the raw material used, and also the place of manufacture. Articles of British manufacture and materials were invariably purchased when their quality was satisfactory and their price not unreasonably greater than corresponding articles of foreign manufacture or material. In the case of those cords the specification called for English spun yarn.

Working Days Lost.

On December 7th Sir A. STEEL-MAITLAND, the Minister of Labour, informed Sir V. Warrender that the number of working days lost through industrial disputes was nearly 8¼ million in 1924, nearly 8 million in 1926, about 162 million in 1926, and rather more than 1 million during January to October, 1927.

Coal and Electricity.

On December 7th, during the discussion on the Labour Party's vote of censure, Sir P. CUNLIFFE-LISTER, the President of the Board of Trade, said that one of the most important things in coal was to have efficient electrical plant in this country, and efficient development. The Government had spent the greater part of last session in passing the Electricity Act, which was based on the considered experience of the best business men and the best technical men that it could get to advise it. With regard to getting oil from coal, the Fuel Research Board had been working on that for years. The Government made its own experiments in low-temperature carbonisation, and it had made business arrangements with the Gas Light & Coke Company for a plant on a commercial scale. With regard to the process of hydrogenation, the Government had stepped in, and experiments were being conducted in the Bergius process in conjunction with the British Syndicate. In every direction in which developments in the use of coal on new lines had been regarded as possible the Government had not been behindhand in investigations.

Mr. SPENCER, a miners' leader, advocated the greater use of electrical picks in the mines, and every new scientific and mechanical means that was available.

British Steel for Transmission Lines.

On December 8th, Lieutenant-Colonel THOM asked the Minister of Transport if he would ensure that it was a condition of contracts for the erection of transmission lines by the Electricity Board that British steel was used throughout and not steel rolled from Continental billets.

Colonel ASHLEY said he had no control over the Central Electricity Board with regard to that matter. Parliament had advisedly declined to impose any such condition as was suggested in the question.

Special Orders.

Special Orders have been approved in respect of part of the township of Great Barr, in the rural district of Walsall, and part of the parish of Shenstone, in the rural district of Lichfield; the urban district of Barnoldswick, West Riding; the urban district of Earby, West Riding; the parishes of Purley, Sulham, and Tidmarsh, in the rural district of Bradfield, Berks., and for the amendment of the Whitchurch and Pangbourne Electric Lighting Order, 1903; the borough of Southwold and the parishes of Reydon and Walberswick, in the rural district of Blything, East Suffolk; the urban district of Watchet and part of the rural district of Williton, Somerset; parts of the rural districts of Midhurst and Westhampnett, West Sussex; and authorising the County of London Electric Supply Co., Ltd., and the North Metropolitan Electric Power Supply Co. to give a supply of electricity in bulk to each other, and for purposes incidental thereto.

High-speed Turbo-Alternators.

In the abstract of Mr. Paterson's I.E.E. address upon "Power Station Plant" in our issue of December 2nd, mention was made of alternators being constructed at the present time having a maximum output of 34,000 kVA at 3,000 r.p.m. British Brown-Boveri, Ltd., informs us that the Brown-Boveri organisation has two turbo-alternator sets in hand for Poland, each rated at 40,000 kVA, the speed being 3,000 r.p.m.

Correspondence.

Correspondents should forward their communications as early as possible. *No letter can be published unless we have the writer's name and address in our possession.*

The Safeguarding of Birmingham Supply.

My attention has been called to an advertisement inserted in your issue of December 9th by the Chloride Electrical Storage Co., Ltd., in which it is suggested that the public supply in Birmingham failed on stated dates.

The facts are that on the 26th ult. there was an interruption in a small outlying section of the city, the maximum demand on which amounted to only 450 kW compared with a total demand on the whole undertaking of 132,000 kW.

I wish to point out that the large supply given in the business centre of the city, covering public buildings, hospitals, &c., is at present safeguarded by a large installation of storage batteries put in for the very purpose that is suggested by the Chloride Company in their advertisement.

I must therefore protest very strongly against the public being led to believe that the supply in Birmingham is not safeguarded.

To cite an interruption where approximately only one 300th of the supply was affected, and this in an outlying district, is misleading and unfair and is calculated to undermine the confidence of the public in electricity supply generally.

R. A. Chattock,
City Electrical Engineer.

Birmingham, *December 10th*, 1927.

The Temperature-E.M.F. Curve for a Copper-Constantan Junction at High Temperatures.

In connection with an investigation on the generation of electricity direct from heat, I have had occasion to measure the thermo-electric e.m.f. developed by a copper-constantan junction for temperatures higher than the melting point of copper, and so far as I am aware, no results of such measurements have yet been published.

The method by which these measurements were obtained was as follows: Two steel tubes, each about 18 in. long, were provided to form sheaths for the copper and constantan wires respectively. At one end of each of these steel sheaths the corresponding element projected by about 3/16 in., and it was made a tight fit in the tube for a length of about 1 in. Into this tight-fitting length of each element was screwed a thinner rod of the element, this extension being carefully insulated from the steel tube. The extension was then led away to the high-resistance voltmeter by which the developed e.m.f. was measured. On to that end of each steel tube from which the elements projected by a small amount, was cast a block of nichrome. The end of each element thus became embedded in the block of nichrome and thus the thermo-electric junction was formed. This junction was placed in a short length of fireclay tube, and in the same tube was laid a standard platinum: platinum-rhodium junction, the fireclay tube being then heated in a gas furnace.

In this way it was possible to measure the developed thermo-electric e.m.f. at temperatures above that of the melting point of copper, the molten copper being held in the cavity in the cast nichrome block.

The e.m.f.-temperature curve so obtained is shown in fig. 1. This curve shows the readings taken during the heating of the couple, the heat of the furnace being so adjusted that the

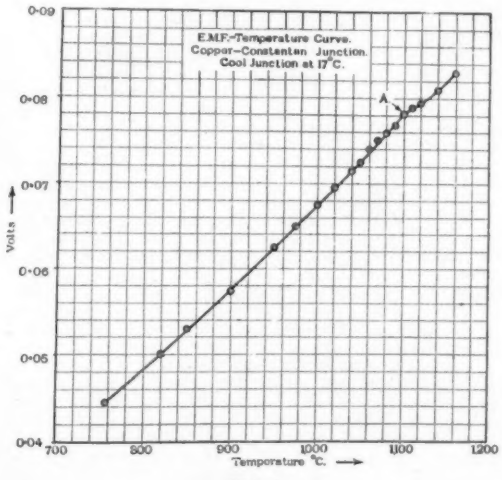


Fig. 1.

rate of rise of temperature was small. In order to provide a check on these results, a second set of readings was subsequently taken with an entirely new copper-constantan junction constructed in the same way, and readings were taken both for a slow rate of heating and for a slow rate of cooling. It was found that there was practically no difference between the heating and cooling results for the range of temperatures so examined.

A comparison of the lower range of the curve of fig. 1 with the individual values obtained for a copper-constantan junction at temperatures corresponding to the melting points of tin, zinc, aluminium, common salt, and silver respectively, showed close agreement.

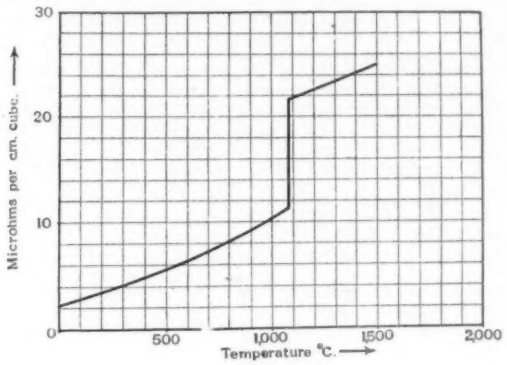


Fig. 2.

Reference to fig. 1 shows a remarkable change in the shape of the curve at the point marked A, which corresponds very closely to the melting point of copper. This seems to show that when copper has become molten, a marked and sudden change takes place in its thermo-electric properties.

The sudden change of thermo-electric characteristic which takes place when the copper becomes molten is accompanied by a sudden increase of the specific resistance. This is seen by reference to fig. 2, in which the specific resistance of copper has been plotted as a function of the temperature. It is seen from this curve that at the temperature at which copper melts, the specific resistance of copper when molten is about twice as great as when the copper is solid. This sudden change of resistance at the melting point of a metal is a well-known phenomenon.

T. F. Wall.

University of Sheffield, *December 5th*, 1927.

The Economics of Electricity Supply.

Will you kindly allow me to point out that there is nothing in Mr. D. J. Bolton's article that was not said by me with equal clarity and greater simplicity forty years ago? Also that it was published and put into actual use when I was burgh electrical engineer at Ayr in 1896.

The division of costs into (*a*) Fuel, (*b*) All other charges, has now been adopted by the Electricity Commissioners, and as they (presumably) have the power, there is no good reason why they should not compel all costs to be presented in this form. This was suggested by me to the Municipal Electrical Association in 1896.

In Mr. Bolton's letter in your last issue he says: "No one would suggest a two-part tariff to cover all domestic consumers, still less that the standing charges should be based on the maximum demand." With the latter sentence I heartily agree, but as regards the first, this is exactly what I *would* do, because, speaking both as the originator of the scheme and as supply engineer, I consider it to be the only fair method.

The supply engineer has no raw material to buy and no entity to sell. He merely charges his mains with potential energy, which by the turning of a switch becomes actual energy, for which the customer pays. This is registered by the meter and is not disputed. But the engineer must also provide service, *i.e.*, he must have plant running at all hours, so that the customer may draw his guaranteed supply as and when required. This service costs a certain sum per annum which, divided by the kW connected multiplied by 365, gives a strictly fair charge for each kW-day connected. This, added to the cost of fuel per kWh, gives the base-charge for the first hour per day. For any given period the total would be for as many base-hours as there are days in the period plus the remaining hours at fuel rate. Both base and fuel hours would, of course, have the necessary profit added. It was also provided that meter rents should be included in the standing charges, thereby abolishing a source of, in my opinion, legitimate complaint—the grocer does not make a special charge for his scales. My system gives the consumer perfect freedom from all vexatious and unnecessary restrictions and encourages the use of the supply, because he knows that each additional unit used will cost him only about a halfpenny. The charge of £13 10s. per annum (Mr. Bolton's figure) is 9d. per day, while the charge by municipal works, as shown in my letter of six weeks ago, should be below 3d. At Ayr with two 100-kW sets, one working and one spare, it was only 6½d.

Ernest G. Pink.

London, *December 10th*, 1927.

A.C. Motor Windings.

In the current issue of the ELECTRICAL REVIEW, Mr. A. V. Clayton, in his article on "The Choice of Voltage for A.C. Motors," states that British manufacturers are prejudiced against making small- and medium-powered high-pressure motors. Mr. Clayton is surely under a misapprehension. By "small motor" the article later implies that a 50-h.p. motor is intended, and few manufacturers will refuse to build a 50-h.p., 3,000-volt motor. Down to about 40 h.p. there are no particular difficulties entailed in building high-pressure motors, but on smaller machines there are several factors introduced which render them more costly than the low-pressure motor and transformer.

Mr. Clayton has stressed the importance of reliability, but has eliminated, on the score of cost, the type of winding which is particularly suitable for high-pressure machines of small horse-power. Here, again, Mr. Clayton seems to be mistaken. The "needle" or "pull-through" winding is undoubtedly more costly than the open-slot type. As regards reliability, the latter can have all the advantages of the former without any of its serious disadvantages, the most serious of which is that the wire has to be handled so much that there is every possibility of it being damaged.

The great advantage of the open-slot machine for high-pressure work is that the coils can be completely insulated before they are placed in the slots, and adequate insulation can be provided between sections. Furthermore, the separate coil, as well as the complete winding, can be thoroughly impregnated

Individual wires of the "pull-through" winding are subjected to much more abrasion in the process of winding than those of formed coils, and, as Mr. Clayton points out that the majority of breakdowns on high-pressure motors occur between turns, the formed-coil, open-slot construction is undoubtedly superior to the "needle" winding.

Dorothy Smith, A.M.I.E.E.

Manchester, *December 5th*, 1927.

Operating Experiences at 1,300-lb. Steam Pressure.

In your report of the discussion of Mr. J. Anderson's paper given at the autumn meeting of the Institute of Fuel, it would appear that I stated that we had no corrosion trouble with a feed-water oxygen content of 0.2 cm³ to 0.5 cm³ per litre.

What I said was to the effect that during the period in which we experienced corrosion troubles, the above values were representative of our feed-water oxygen content.

To ensure against corrosion we endeavour to maintain less than 0.1 cm³ of oxygen per litre, and in addition carry a definite alkalinity in the boiler feed water.

John Bruce.

Barking, *December 10th*, 1927.

The Perfect Clock.

Mr. Turnbull's short article brings up a subject of considerable interest, but it is necessary to criticise his "comments."

To begin with, the idea of using a beam of light for the signal for timing the impulses is quite old. He will find it as far back as 1904 in an article by Siegl (*Sc. Abs.*, 1904A; No. 2309) and again in two papers published by Ferrié in 1924 (*Sc. Abs.*, 1925A, Nos. 1537, 1538).

His proposed driving device belongs to quite a large family, all having the drawback that their driving force varies far too much with the state of the battery to make accurate time-keeping possible. To give a clock of this kind a chance of equalling the best clocks now in use, it would be necessary to hold the driving current constant within one part in a thousand.

The relay for cutting down the current when the amplitude is too large is no doubt intended to deal with this difficulty, but it would appear to make no provision for increasing the current when it is too small. In any case, it is probable that Mr. Turnbull does not realise that for an approach to the "perfect clock" he must keep the amplitude constant within about one arc-second, or, say, 0.0002 inch.

It is wrong to state that the impulse should be given at the centre of the swing, but here Mr. Turnbull is less to be blamed than the host of other people who have already said so.

It is also erroneous to assume that an advantage is necessarily obtained by running in a vacuum. It may be so, or it may not, according to circumstances. Direct errors are diminished, but the indirect ones, which include the circular errors, are increased, and usually the latter are the more important.

One rather suspects that the ton of coals has been unjustly blamed. A calculation made some time ago showed that the variation of gravity on a certain bridge over tidal waters, where the rise and fall amounts to over 40 ft., was only one part in two millions with this huge body of water. That is just on the borderland of what might perhaps be detected by the very best clocks. The effect of the ton of coals would be very much smaller and quite insensible.

David Robertson.

Merchant Venturers' Technical College, Bristol.
December 6th, 1927.

Testing 33-kV Cables.

It was very satisfactory to note, on reading the correspondence on this subject in your issue of 2nd inst., that Mr. Riley also is averse to making any maximum figure for dielectric resistance a condition of acceptance. The reasons he gives are ample and should fully convince any doubters. The time has long gone by when any manufacturers would treat a cable purely with a view to getting megohms.

With regard to the stability test also, now that Mr. Riley has referred to the point the present writer would like to add a protest against the idea of making the permissible tolerance a percentage rather than a fixed amount. The latter would really more fully carry out the intention of the authors, because theoretically the graph connecting voltage and power factor should be a horizontal line, and departure from this, however small, indicates an ionisation component in the "leakance." Clearly such a component, if present at all, should be strictly limited whatever the value of the other components may be.

It is to be feared that Mr. Fernie rather misses the point so far as the intention of special a.c. testing is concerned. The aim to carry out as much testing as possible with d.c. is in agreement with the present writer's ideas. There is, however, up to now no known connection between insulation resistance with d.c. and dielectric loss with a.c., at any temperature. Farther than this, the aim of the stability test is to discover whether the process of expanding and contracting has opened up voids of sufficient magnitude to cause appreciable ionisation loss at working voltage and over. This test can only be carried out with alternating voltage because one component, at least, of the losses is dependent on frequency.

It is, of course, perfectly correct that the temperature attained by a cable carrying a given current depends on the cooling effect of the surrounding medium as well as on the thermal resistance of the cable. When, however, the manufacturer guarantees the current-carrying ability of a cable, the temperature to be attained is contingent on a certain value for the thermal resistivity of the soil, and the latter is usually a figure well above what is likely to be encountered. If along any section of a cable route extra thermal resistance is expected it is customary to insert a length of cable having a greater cross section of copper than that of the main portion of the cable.

M. C. Timms.

Leeds, *December 5th*, 1927.

I have read with interest the article on 33,000-volt cable testing, and I agree with Mr. Riley that the suggested upper limit for dielectric resistance is inadvisable.

In the bending test an upper temperature limit of 20 deg. C. seems rather low; the ordinary shop temperature in summer in my experience may rise to over 25 deg. C. Is it proposed that special cooling arrangements must be provided? As regards tests after laying, the authors recommend a d.c. voltage test of five times the working pressure. It would be interesting to know the data on which this high pressure is based. A few years ago I was associated with some tests in which alternate sections of a length of l.p. cable were broken down with a Delon set and ordinary a.c. voltage. The mean d.c. breakdown was very approximately root two times the a.c. voltage. The Kenotron should give a more severe test, if there is any difference. Are the relative conditions for high voltages entirely different? Is there not a danger of the insulation partially breaking down during the 15 minutes' test and the effective dielectric thickness being so much reduced that the cable breaks down in a few months' time under working conditions?

Surely all that is required after laying is proof that no mechanical damage has occurred during laying and that the joints are sound. For this double the a.c. working voltage is more than ample, and a higher d.c. voltage than the corresponding a.c. peak is surely to be deprecated from the user's point of view. If this test is insufficient, it might be worth while to investigate the possibilities of taking the d.c. charge current readings at definite intervals of time, as has been done in the United States, but carried further, on the lines familiar to all submarine-cable engineers, by discharging the cable, and repeating the test with the reverse pole to line. If the cable is good the two sets of readings should be identical, if the submarine cable analogy holds good. There is no *prima facie* reason why it should not, that I am aware of.

E. P. Elwin.

London, *December 5th*, 1927.

Resistance Amplifiers.

May I reply as briefly as possible to Mr. Phillips's further communication on the above subject? Frankly, I do not follow what Mr. Phillips intends to convey by the first paragraph of his letter, or exactly how he wishes me to consider the problem. I can only conclude that he cannot have read either my article or my reply to his first letter very carefully. There are no two ways of considering the matter. I pointed out both in my article and in my first letter that one simply has a combination of resistances and capacities, and in order to find the loss at any frequency one merely calculates the voltage affecting the grid circuit, for a given voltage in the preceding anode circuit. This is elementary electricity, and,

to use a favourite expression of Mr. Phillips, is obvious to any competent radio engineer. In his first letter he mentions that the relation is given by

$$\omega T / \sqrt{(\omega^2 T^2 + 1)}$$

and in my reply to that letter I said that I entirely agreed with it. Where Mr. Phillips and myself do not agree is over the allowable loss in a coupling unit. In order, I hope, finally to clear up the matter let me bring Mr. Phillips back to the original point of contention by examining an amplifier built according to our respective designs. Readers will remember that Mr. Phillips recommends a grid condenser of 0.005 mfd. and a leak of 1 megohm giving a time-constant of 0.005, while I recommend a grid condenser of 0.1 mfd. and a grid leak of 0.5 megohm giving a time-constant of 0.05. In order to make the matter clear to the non-technical reader I have prepared two graphs, computed from rough slide-rule calculations, using methods and formulæ upon which Mr. Phillips and myself are agreed. The first shows the amplification at various frequencies up to 100 cycles with my time-constant and Mr. Phillips's time-constant. The second shows the amplification at 30 cycles and 50 cycles with the two time-constants up to four stages of amplification.

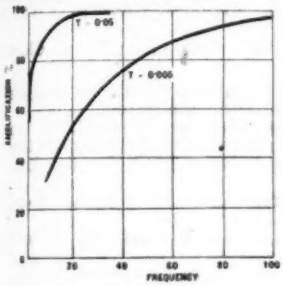


Fig. 1.

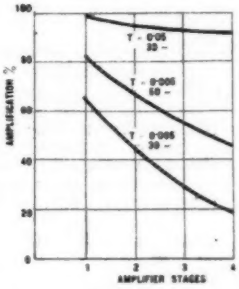


Fig. 2.

The graphs are most illuminating and show that with three stages Mr. Phillips's arrangement results in a loss at 30 cycles of about 70 per cent., and at 50 cycles a loss of about 45 per cent. With my arrangement the loss is only a few per cent. even at 30 cycles. But even this does not show the true position, since the loud speaker is almost sure to introduce another loss on the lower frequencies, causing with Mr. Phillips's arrangement a total loss of about 75 per cent. Personally, I do not see how Mr. Phillips justifies his design, except perhaps in the case of one stage with an early type of speaker which cuts off at about 50 cycles, but surely little attention is now paid to apparatus of such a type.

Mr. Phillips very kindly asks me to witness certain tests in his laboratory, which personally I should be delighted to do, but in view of my position I should be very reluctant to enter the research department of his company, which point I am sure he will appreciate. I do not think, however, that the tests would be very illuminating because, in the first place, no mention is made of the values of the other components or the number of stages in the amplifier. Further, I am not sure from memory what the response curve of the R.K. speaker is like, but I do not think it does very much below 50 cycles, and I believe there is also a rather strong resonance just above.

No doubt Mr. Phillips and myself look at the matter from different points of view. He, I presume, is interested chiefly in the production of popular broadcast receivers, while I am more interested in such things as multi-stage microphone amplifiers or public address apparatus.

With regard to taking 25 cycles as a lower limit, 25 cycles is musical and is not exactly a rattle. It ensures that in a multi-stage amplifier there is practically no loss whatever on the lowest pedal notes of the organ. The greatest difficulty on the lower frequencies is that of obtaining sufficient radiation from the diaphragm. I remember experimenting with a speaker about a year ago which certainly shook the walls on about 30 cycles, but it required absolutely no loss of amplification to do it. I do not think it will be very long before really good speakers of this type have left the laboratory stage and become as general as the popular cone of this year. My second graph indicates how inefficient they are when used with coupling units having small time-constants. Grid current is not tolerated in a properly designed amplifier, and I cannot see that a large time-constant introduces any trouble. I believe I am correct in saying that the standard Marconi B amplifier uses a large time-constant and the B.B.C. transmissions do not appear to have suffered as a consequence.

In conclusion, may I add that Mr. Phillips has misread my statements regarding paper condensers. I did not state that they were necessary, neither did I state that they were used in the best apparatus. I merely referred to the values of condensers used in what Mr. Phillips describes as "the best apparatus." I stated that "paper" dielectric condensers were satisfactory provided that the insulation resistance was sufficiently high, and pointed out that there were several treated paper dielectrics. I cannot conceive of anyone utilising a thin Mansbridge-type dielectric in a multi-valve amplifier using high voltages. It would be just as ridiculous as using inferior ebonite for high-voltage insulation.

Paul D. Tyers.

Watford, *December 8th.*

[This correspondence is now closed.—EDS. ELEC. REV.]

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1926.

12,208. "Method of rendering visible oscillations of piezo-electrical crystals." Dr. E. Glebe and Dr. A. Scheibe. May 1th, 1925. (252,170.)

12,472. "Methods and apparatus for producing therapeutic rays." E. W. Boerstler. May 28th, 1925. (252,703.)

12,836. "Apparatus for amplifying electric oscillations." E. C. R. Marks (Radio Frequency Laboratories, Inc.). May 15th, 1926. (280,606.)

18,630. "Electron discharge devices." L. J. Davies and British Thomson-Houston Co., Ltd. July 19th, 1926. (280,617.)

20,046. "Electric telegraphs." J. W. Milnor and Western Union Telegraph Co. August 14th, 1926. (280,620.)

20,186. "Dynamo-electric machines." H. Charlet. August 16th, 1926. (280,624.)

20,208. "Magnetic materials." Western Electric Co., Inc. June 30th, 1926. (273,638.)

20,248. "Transmitting and receiving apparatus for a television system." R. Hall. August 17th, 1926. (280,630.)

20,276. "Globe or shade retaining means for illumination fittings." British Thomson Houston Co., Ltd., and H. C. Wheat. August 17th, 1926. (280,632.)

20,278. "Protection of overhead electric lines." British Thomson-Houston Co., Ltd., and F. H. Clough. August 17th, 1926. (280,633.)

20,287. "Furnaces." General Electric Co., Ltd., and G. G. Bell. August 17th, 1926. (280,634.)

20,308. "Ventilation and cooling of dynamos, electric motors and similar machines." H. Chitty. August 17th, 1926. (280,635.)

20,309. "X-ray shields and process for making them." P. E. Harth. August 17th, 1926. (280,636.)

20,385. "Telephone with free vibrating diaphragm surface." Neufeldt and Kuhnke Betriebs-Ges. August 19th, 1925. (257,271.)

20,485. "Means for supplying electric current to thermionic valves." W. S. Smith and N. W. McLachlan. August 19th, 1926. (Cognate application 2,645/27.) (280,645.)

20,551. "Radiators applicable more especially for use in cooling alternating-current transformers." J. Sankey & Sons, Ltd., and N. Martin. August 20th, 1926. (280,649.)

20,677. "Magnetic materials." Western Electric Co., Inc. July 12th, 1926. (274,136.)

20,996. "Electrically-operated selecting and controlling mechanism for telephone systems and like purposes." A. Watts. August 26th, 1926. (280,654.)

21,463. "Flow-measuring apparatus." Siemens & Halske Akt. Ges. September 8th, 1925. (258,248.)

21,641. "Electric remote control systems." British Thomson-Houston Co., Ltd. September 2nd, 1925. (257,937.)

21,935. "Process and apparatus for sterilising clear and turbid liquids by means of ultra violet rays." E. O. Scheidt. September 6th, 1926. (Convention date not granted.) (257,956.)

22,458. "Automatic and semi-automatic telephone systems." Siemens Bros. and Co., Ltd., and W. H. Grinsted. September 11th, 1926. (280,665.)

25,188. "Combined electric tumbler switch and fuse." T. D. Edwardes. October 9th, 1926. (280,685.)

25,935. "Electric contact plugs, couplings, and the like." L. H. Wadsworth. October 18th, 1926. (280,689.)

26,399. "Electrical condensers." Dubilier Condenser Co. (1925), Ltd. April 29th, 1926. (270,242.)

26,756. "Synchronising of alternating-current machines." British Thomson-Houston Co., Ltd., R. D. Parry, H. S. Petch, and C. F. Humphreys. October 26th, 1926. (280,693.)

27,155. "Process of coating a body with platinum." S. G. S. Dicker (Namlooze Vennootschap Philips' Gloeilampenfabrieken). October 29th, 1926. (280,697.)

28,707. "Electromagnetic brakes." M. Dewhurst. November 15th, 1926. (280,708.)

29,140. "Electrical turning-gear for starting internal-combustion engines." F. H. Royce. November 18th, 1926. (280,709.)

30,819. "Ultra-violet lamps." J. P. Foster. November 25th, 1926. (280,711.)

31,418. "Mercury-vapour lamp." E. Goltstein. May 26th, 1926. (271,812.)

1927.

300. "System of connections for direct current series twin motors." Maschinenfabrik Oerlikon. July 27th, 1926. (275,151.)

2,178. "Electric igniting devices or torches, and particularly electric igniters for pipes, cigars, and the like." A. H. Dutton. January 25th, 1927. (280,747.)

2,595. "Apparatus for the rectification of alternating current." H. G. Andre. January 28th, 1927. (Addition to 224,871.) (280,751.)

3,092. "System of vehicle lighting." J. Borel. February 3rd, 1927. (280,753.)

3,273. "Spring switch-points, more particularly for tramway tracks." E. Hesse Ges. February 6th, 1926. (265,611.)

4,071. "Systems of electric distribution." British Thomson-Houston Co., Ltd. February 17th, 1926. (266,337.)

4,917. "Electric cables." M. Sieverts Fabriks Aktiebolag. February 20th, 1926. (266,385.)

6,293. "Electric switches." R. W. L. A. Ham. March 7th, 1927. (280,769.)

6,447. "Hornless loud-speaker." O. Bothe. March 8th, 1927. (280,772.)

8,063. "Squirrel-cage rotors." Siemens-Schuckertwerke Ges. March 29th, 1926. (268,355.)

8,176. "Method of producing electric lead accumulators." Dr. F. Aletter. March 29th, 1926. (268,366.)

10,584. "Baking apparatus." British Thomson-Houston Co., Ltd. April 22nd, 1926. (269,900.)

11,491. "Arrangement for the distant control of switching devices." Akt. Ges. Brown, Boveri et Cie. April 29th, 1926. (270,325.)

12,953. "Reduction gears for effecting fine adjustments in wireless and other scientific apparatus." F. Lafont. October 5th, 1926. (278,661.)

13,028. "Electrically-operated audible warning signals." J. F. Monnot and Klaxon, Ltd. May 14th, 1927. (280,808.)

16,006. "Electrical resistance furnaces." Metallwerk Plansee Ges. and P. Schwarzkopf. June 16th, 1926. (272,933.)

16,517. "Thermionic valves." C. Tourne. September 30th, 1926. (Addition to 273,293.) (278,317.)

16,518. "Electric lamps." C. Tourne. November 10th, 1926. (Addition to 273,293.) (280,496.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from December 7th :—

E. & E.K. (lettering and design). No. 485,560. Class 5. Copper wire.—E. & E. Kaye, Ltd., Perseverance Wire Mills, Ponder's End, Middlesex.

Duovox. No. 484,584. Class 8. Combinations of radio instruments and gramophones.—M. Verstraeten, 50a, Lord Street, Liverpool.

Bakolin. No. 484,266. Class 50. Electrical insulating material.—High Tension Bakelized Products, Ltd., 49, Moor Lane, E.C.2.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ACCRINGTON.—Station improvements and alterations, for London, Midland & Scottish Railway.

AMESBURY.—School, for Wilts E.C.; county architect, Trowbridge.

BECKENHAM.—Alexandra School (£14,000), for the E.C.; director of education.

BIRMINGHAM.—Reconstruction of two schools, Thilton Street and Ada Road (£30,000); Education Committee. Works showrooms, Government Instructional Factory site, Lancaster Street (£40,000); Halford Cycle Co., Ltd. 908 houses at Erdington, 287 at Billesley; city engineer. 'Bus repair depôt, Birches Green; tramway manager. Secondary school, Northfield Road, King's Norton; Education Committee.

BOLTON.—Extensions to works, Bridgman Street; W. Wadsworth & Sons, Ltd. Extensions to mills, Parrot Street; Jabez Johnson, Hodgkinson & Pearson. Race track, Manchester Road; Bolton Greyhound Racing Co., Ltd.

BRAINTREE.—School (£7,200), for Essex E.C.; J. Stuart, county architect, Chelmsford.

BRISTOL.—School, Bedminster Down, for the Borough E.C.; Maynard, Froud & Stevens, architects, St. Stephen's Chambers, Baldwin Street. School, Shirehampton, for the Borough E.C.; Josiah Green, clerk.

BURNLEY.—Extension of Todmorden Road Central School (£3,500); Education Committee.

CANTERBURY.—Motor showrooms, garage, and service station, Ersham House Estate; particulars from H. Anderson. Houses (20), for the T.C.; Cox Bros., builders, Maidstone.

CHELTENHAM.—Workshop and motor house, Tivoli Road; F. J. Griffin.

CHESTERFIELD.—Works extensions, J. & J. Dyson, Ltd., off Sheffield Road, and Hyde & Sons, Ltd., Clarendon Works. Additional 20 houses, for the T.C.; borough surveyor.

CHICHESTER.—Offices, for the West Sussex E.C.; director of education.

COLCHESTER.—Greyhound racing track; Capt. W. H. Rowe, 191, Maldon Road.

DARLINGTON.—Houses (20) and assembly hall; J. Clayton. Additional 50 houses, for the T.C.; borough surveyor.

DUDLEY.—Re-housing scheme (several hundreds), for the T.C.; borough surveyor. Race track near County Grounds; Greyhound Syndicate. Clinic at infectious diseases hospital; borough engineer. Storerooms and offices, Hope Works; E. Vaughan & Sons.

DUNFERMLINE.—Conversion of hotel into offices for municipal departments; burgh surveyor.

EASTBOURNE.—Church, Victoria Drive; Catholic Diocesan authorities. 40 houses, King's Drive Estate; Baldwin and Co. Alterations, Glastonbury Hotel, Royal Parade; A. Ford, architect. 48 houses, Martello site; W. J. Simms, Son & Cock, Ltd., Nottingham.

FLEETWOOD.—Extension of fish dock, for London, Midland and Scottish Railway.

GALASHIELS.—Maternity ward at the Hospital; Committee of Management.

GLASGOW.—426 houses at Knightswood, for Corporation; J. Macdonald, Ltd., builders. Creamery at Bathgate, and extensions to premises at Glasgow and Dundee (£20,000), for Scottish Co-operative Wholesale Society; manager, Glasgow.

GOMERSAL.—Housing scheme (70), for Spenborough U.D.C.; Arthur Rothera, surveyor, Cleckheaton.

GUILDFORD.—Church, Aldershot Road housing estate, for the Congregational Church; C. T. Bateman, secretary. School, Stoke Hill (£14,380), for the Borough E.C.; Sanderson & Stainsby, architects, Stockton-on-Tees.

HAROLD WOOD.—School (£7,931), for Essex E.C.; J. Stuart, county architect, Chelmsford.

HARROGATE.—Church, Bilton, for the Congregational trustees; secretary.

ILKESTON.—Oil depôt, Cotmanhay Road; Anglo-American Oil Co., Ltd.

INDIA (Bombay).—Nurses' home, Arthur Road Hospital; Municipal Commissioner.

IRISH FREE STATE (Co. Meath).—Hospital improvements (£5,000), for the County Board of Health.

LEEDS.—Laboratory; Medical Officer of Health. Depôt for Gas Department, New York Road (£50,000); J. H. Wood and Co., Ltd. Clothing factory, Gelderd Road; Burras Peake, Ltd. Dance hall, Low Road, Hunslet; H. Pemberton.

LEIGH.—Housing scheme (168), Cow Lane; T. A. Clare, borough engineer.

LONDON (E.C.).—Extensions, St. Bartholomew's Hospital (£177,225); Dover Bros., Ltd., contractors.

(Barking Town, E.).—26 houses, Parsons Row; U.D.C. surveyor. 64 houses, Faircross Estate; E. Glenny & Son.

(Walthamstow, E.).—School, Billet Road, for the E.C.; director of education.

(Bermondsey, S.E.).—Factory extension, Grange Road; E. A. Roome & Co., Ltd.

(Dulwich, S.E.).—Church, Lordship Lane; W. Wilmot, Ltd.

(Eltham, S.E.).—Two schools, for the London E.C.

(Woolwich, S.E.).—Additional housing schemes (215), for the T.C.; borough engineer.

(Brixton, S.W.).—Police dwellings (£180,281) for the City Corporation; Cropley Bros., Ltd., contractors.

(Wimbledon, S.W.).—Showroom and garages, Worple Road; J. S. Brockleby. Greyhound track, Plough Lane; Elcock and Sutcliffe.

MAIDSTONE.—Brass foundry, Tovil, for the Kent Brass Foundry Co.

MANCHESTER.—Elementary school, Soss Moss (£63,000); Education Committee. Workshops extension, Wharf Street and Back Factory Street; Corporation Health Department.

MUSSELBURGH.—Workers' Welfare Institute (£10,000), for Inveresk Paper Co.; the manager.

NEWQUAY (Cornwall).—40 houses for the U.D.C.; G. W. Walters, deputy surveyor, Beach Road.

NORTHAMPTON.—Public hall, for the T.C.; borough engineer. Warehouse, Scarletwell Street; Hooton Bros.

OLDHAM.—Extensions, cotton warehouse, Glodwick Road; Lees & Wrigley, Ltd.

PETERBOROUGH.—Central bakery, for the Co-operative Society, Ltd.; secretary.

PLYMOUTH.—Concert hall, baths and winter gardens, West Hoe; Parks Committee. Education offices, James Street and Cobourg Street; Education Committee. Hall, Bath Street; Town Mission Committee.

PORTSOY.—Harbour extension scheme (£17,000); Henderson and Nicol, engineers, Aberdeen.

RAMSGATE.—Conversion of Cavendish House into police station and offices, for the T.C.; Harry H. Stroud, architect, 37, High Street.

REIGATE.—Block of shops, showrooms and flats, Church Street, for F. W. Marten.

RUABON.—Extensions, Girls' County Schools, for Denbighshire E.C.; W. D. Wiles, county architect, Acton Hall, Wrexham.

SANDY (Beds.).—Housing scheme (50), for the U.D.C.; surveyor.

SHEFFIELD.—Central library; W. D. Davies, city architect.

SINFIN (Derby).—Works (£35,000), for F. W. Hampshire and Co., Ltd.; Gee, Walker & Slater, Ltd., contractors.

SITTINGBOURNE.—Offices, showrooms, &c., West Street, for W. J. Pullen, Ltd.

SLOUGH.—Secondary school; County Education Authority.

SUSSEX.—Joint mental colony; West and East Sussex County Councils.

TOBERMORY.—School for Argyll County Education Authority (electric lighting); R. Cameron, Master of Works, Education Offices, Dunoon.

TRANENT (N.B.).—Roman Catholic church; rector, Catholic Church.

WEST KIRBY (Birkenhead).—Church, Brookfield Gardens, for the Unitarian trustees; secretary.

YORK.—Conversion old library, Clifford Street, for technical school; Education Committee.